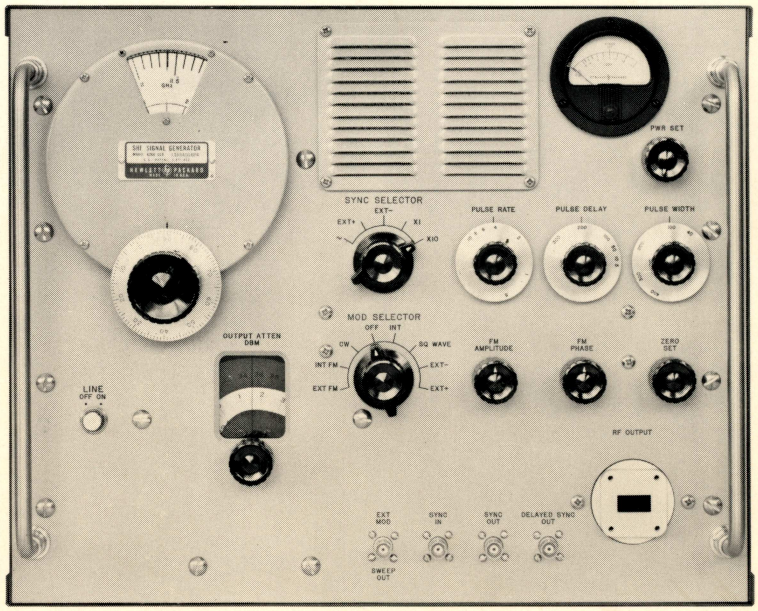
W. E. Schroeder

OPERATING AND SERVICE MANUAL

# SHF SIGNAL GENERATOR

## 626A

Ser# 1401A01942

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## CERTIFICATION

*The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.*

## WARRANTY AND ASSISTANCE

All Hewlett-Packard products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain major components listed in the operating manual, for the specified period. We will repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. No other warranty is expressed or implied. We are not liable for consequential damages.

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# MANUAL CHANGES

**MANUAL IDENTIFICATION**

**Model Number:** 626A
**Date Printed:** March, 1972
**Part Number:** 00626-90005

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

**To use this supplement:**

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

| Serial Prefix or Number | Make Manual Changes |
|---|---|
| 1210A01731 to 01800 | 1 |
| 1308A01801 to 01850 | 1, 2 |
| 1308A01851 and above | 1 – 3 |

| Serial Prefix or Number | Make Manual Changes |
|---|---|
| ► 1410A | 1 – 4 |
| | |
| | |

► NEW ITEM

Our serial prefix is 1401A. What changes apply?

## ► ERRATA

Page 5-19, paragraph 5-57:
Step d: Change "<3 microseconds" to "<5 microseconds."

## CHANGE 1

Page 5-25, Figure 5-20:
Change R43 to 1.23M.

Page 6-5, Table 6-1:
Change R43 to 0730-0108 R:FXD, DEP C, 1.23M 1% 1W, 28480, 0730-0108.

Page 6-11, Table 6-2:
Add 0730-0108 R:FXD, DEP C, 1.23M 1% 1W, 28480, 0730-0108.

## CHANGE 2

Page 6-2, Table 6-1:
Change C36 to 0160-0595, C:FXD PAPER 0.25 UF ± 10% 1500 VDCW.

Page 6-3, Table 6-1:
Change C39 to 0160-0593, C:FXD PAPER, 1 UF ± 10% 600 VDCW.

**NOTE**

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

4 March 1974
2 Pages

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## CHANGE 2 (Cont'd)

Page 6-9, Table 6-2:
Add:
0160-0593, C:FXD PAPER 1 UF ± 10% 600 VDCW, 56289, P34315.
0160-0595, C:FXD PAPER 0.25 UF ± 10% 1500 VDCW, 56289, P52789.

NOTES

1. When 0160-0593 first replaces 0160-0088, a new mounting bracket, HP Part Number 1400-0512, must also be ordered.

2. When 0160-0595 first replaces 0160-0079, a new mounting bracket, HP Part Number 1400-0526, must also be ordered.

## CHANGE 3

Page 5-25, Figure 5-20:
Change R69 to 75K.

Page 6-5, Table 6-1:
Change R69 to 0686-7535, R:FXD COMP 75K OHM 5% 1/2W.

Page 6-9, Table 6-2:
Add 0686-7535, R:FXD COMP 75K OHM 5% 1/2W, 01121, EB 7525, 1, 1.

Page 6-10, Table 6-2:
Delete 0687-5631.

## ► CHANGE 4

Page 4-9, Figure 4-15:
Change R98 to 2500 ohms.

Page 5-27, Figure 5-22:
Change R98 to 2500 ohms.

Page 6-6, Table 6-1:
Change R98 to 2100-0207, R: VAR, CONT, 2.5K OHM 20% MC.

Page 6-12, Table 6-2:
Delete 2100-0025.
Add 2100-0207, R: VAR, CONT, 2.5K OHM, 20% MC.

OPERATING AND SERVICE MANUAL

# MODEL 626A

**SERIALS PREFIXED: 1210A**

# SHF SIGNAL GENERATOR

This manual applies directly to instruments with serial numbers prefixed 1210A .

With changes described in the Backdating Appendix, this manual also applies to instruments with serial numbers prefixed 1202A or lower.

Manual Part No. - 00626-90005
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**Printed: Mar. 1972**

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ILLUSTRATED PARTS IDENTIFICATION


| | | |
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| 1. | HP Model 626A, S. H. F. Signal Generator, General Arrangement | 2 |
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Figure 1-1. HP Model 626A SHF Signal Generator

Table 1-1. Specifications

Frequency Range:
10 to 15.5 GHz

Frequency Calibration:
Dial read directly in GHz; accuracy better than ±1%

Output Range:
10 mW to 1 pW (+10 dBm to -90 dBm); attenuator dial directly calibrated in output dbm; swr less than 2.5 at +10 dBm; 1.35 at 0 dBm and lower

Output Monitor Accuracy:
Better than ±1 dB

Output Attenuator Accuracy:
Better than ±2% of attenuation in dB introduced by output attenuator

Output Connector:
0.850 in. by 0.475 in. waveguide, WR-75 Flat Cover Flange

Leakage:
Less than minimum calibrated signal generator output

Modulation:
Internal or external pulsed, FM or square wave

Internal Pulse Modulation:
Repetition rate variable from 40 to 4000 pps; pulse width variable 0.5 to 10 microseconds

Sync Out Signal:
20 to 50 volts amplitude into 1000-ohm load. Better than one microsecond rise time
(1) Simultaneous with RF pulse - positive
(2) In advance of RF pulse - positive, variable 5 to 300 microseconds

External Synchronization:
(1) Sine wave, 40 to 4000 Hz, amplitude 5 to 50 volts rms
(2) Pulse signals 0 to 4000 pps, 5 to 50 volts amplitude, positive or negative; pulse width 0.5 to 5 microseconds; rise time 0.1 to 1 microsecond

# SECTION I
# GENERAL INFORMATION

## 1-1. DESCRIPTION.

1-2. The HP Model 626A SHF Signal Generator (Figure 1-1) is a general purpose broadband signal generator which produces RF output voltages from 10 to 15.5 GHz. The output frequency is set with a single control and is directly read on a dial calibrated to an accuracy of 1% or better. The output power level is continuously adjustable from -90 dBm to +10 dBm (1 pW to above 10 milliwatts) over the full frequency range. The attenuator calibration is accurate within ±2% of the attenuation in dB introduced by the attenuator.

1-3. The Model 626A is provided with versatile modulation characteristics. The output can be frequency modulated, square-wave modulated, or pulse modulated by internally or externally generated signals. The Model 626A also provides synchronizing pulses for external equipment being used.

1-4. In addition to producing an accurate and controllable radio-frequency test signal, the Model 626A is useful for the following:

a. Testing pulse systems.

b. Measuring sensitivity and selectivity of amplifiers, receivers, and other tuned systems.

c. Measuring signal-to-noise ratio of RF signals.

d. Making slotted line measurements.

e. Investigation of microwave impedances and other transmission line characteristics.

f. Measuring frequency response of microwave systems.

g. Determining resonant frequency and Q of waveguide cavities.

1-5. The Model 626A has a self-contained modulator and power supply located on a deck at the rear of the instrument. The entire chassis and cabinet are fabricated from aluminum alloy. Guard rails are provided on the front panel to facilitate handling, and to protect the operating controls. Front panel connectors are of the BNC type except for the output connector which is rectangular waveguide. Etched circuit construction is used extensively, and circuit accessibility is very good.

Table 1-1. Specifications (Cont'd)

Internal Square Wave Modulation:
Variable 40 to 4000 Hz controlled by "pulse rate" control

Internal Frequency Modulation:
Power line frequency, deviation up to ±5 MHz.

External Pulse Modulation:
Pulse Requirements: Amplitude 15 to 70 volts peak positive or negative; width 1.0 to 2500 microseconds

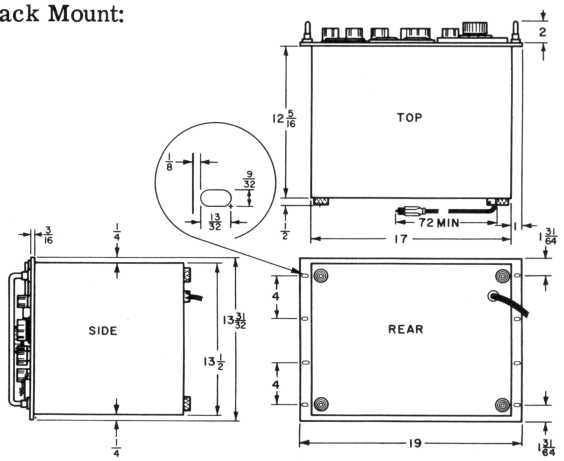
External Frequency Modulation:
Provides capacitive coupling to repeller of klystron; maximum deviation approximately ±5 MHz.

Power Source:
115 or 230 volts ±10%, 50 to 60 Hz, approximately 200 watts

Accessories Furnished:
HP MX292B, M to X band waveguide adapter, WR-75 to WR-90 guide
HP MP292B, M to P band waveguide adapter, WR-75 to WR-62 guide

Dimensions:
Cabinet Mount: 17 in. wide, 14 in. high, 15 in. deep

Rack Mount:




Weight:
Net 65 lb

Accessories Available:
M362A Low Pass Filter

## 1-6. ACCESSORIES FURNISHED.

1-7. The Model 626A is supplied with two different waveguide adapters for connecting the rf output waveguide to either X- or P-band waveguide. The adapters are as follows: Model MX292B used to connect to X-band waveguide; and Model MP292B used to connect to P-band waveguide.

## 1-8. ACCESSORIES AVAILABLE.

1-9. To suppress second and third harmonics an additional 40dB, an HP Model M362A Low Pass Filter is recommended.

## 1-10. INSTRUMENT IDENTIFICATION.

1-11. Hewlett-Packard uses a two-section eight-digit serial number (000-00000). If the first three digits of the serial number on your instrument do not agree with those on the title page of this manual, change sheets supplied with the manual will define differences between your instrument and the Model 626A described in this manual.

# SECTION II
# INSTALLATION

## 2-1. INSPECTION.

2-2. Unpack the instrument upon receipt and inspect it for signs of physical damage such as scratched panel surfaces, broken knobs, etc. If there is any apparent damage, file a claim with the carrier and refer to the warranty page in this manual.

2-3. An electrical inspection should be performed as soon as possible after receipt. See Section V, paragraph 5-62 for performance checks. These procedures make a good test as part of incoming quality-control inspection.

## 2-4. AIR FILTER.

2-5. This instrument is equipped with a renewable type air filter. When first placing the instrument into service, the filter must be coated with a dirt-gathering adhesive. We recommend a water-soluble adhesive such as Super Filter Coat from Research Products Corporation. This adhesive comes in a convenient spray can and is available from most heating supply stores or from your authorized Hewlett-Packard sales representative (HP Part No. 3150-0002). For preventive maintenance on the air filter, refer to paragraph 5-3.

## 2-6. POWER REQUIREMENTS.

2-7. The Model 626A requires a power source of 115 or 230 volts ±10%, 50 to 60 Hz, which can deliver approximately 200 watts.

## 2-8. POWER CABLE.

2-9. This instrument is equipped with a three-prong conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power cable three-prong connector is the ground pin.

2-10. To preserve the protection feature when operating the instrument from a two-contact outlet, use a three-prong to two-prong adapter and connect the pigtail on the adapter to ground (HP Part No. 1251-0048).

## 2-11. 230-VOLT OPERATION.

2-12. To operate the Model 626A from a 230-volt ±10% source, proceed as follows:

a. Turn unit off.

b. Place 115/230 switch on rear to 230 volt position.

c. Change the line fuse to 2 ampere.

## 2-13. REPACKAGING FOR SHIPMENT.

2-14. The following list is a general guide for repackaging an instrument for shipment. If you have any questions, contact your authorized Hewlett-Packard sales representative.

a. If possible, use the original container designed for the instrument.

b. Wrap the instrument in heavy paper or plastic before placing it in the shipping container.

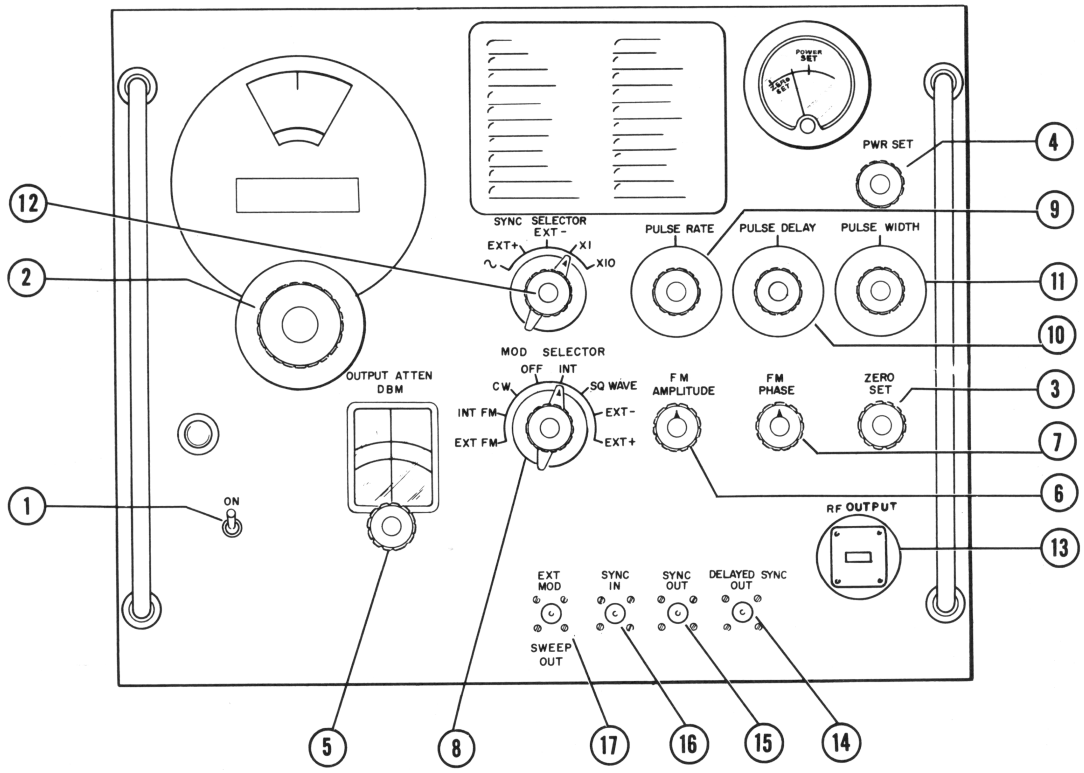
c. Use plenty of packing material around all sides of the instrument and protect the panel with cardboard strips.

d. Use a heavy cardboard carton or wooden box to house the instrument and use heavy tape or metal bands to seal the container.

e. Mark the packing box with "Fragile", "Delicate Instrument", etc.

Note

If the instrument is to be shipped to Hewlett-Packard Company for service or repair, attach to the instrument a tag identifying the owner and indicating the service or repair to be accomplished. In any correspondence be sure to identify the instrument by model number, serial prefix, and serial number.




1. Turns on line power to the instrument.
2. Frequency control (not labeled) is used to set to desired RF output frequency. Frequency dial is read directly in KILOMEGACYCLES (GHz).
3. ZERO SET control is used to zero-set the power-monitor meter.
4. PWR SET control is used to establish the correct power level fed to the output attenuators.
5. OUTPUT ATTEN control adjusts the RF output level from +10 dBm to -90 dBm (10 mW to 1 pW).
6. FM AMPLITUDE control adjusts the frequency deviation of the output signal when internal or external frequency modulation is employed.
7. FM PHASE control adjusts the phase of frequency modulation from approximately +90 degrees to -90 degrees with respect to the SWEEP OUT signal only when internal frequency modulation is employed.
8. MOD SELECTOR switch is used to select the desired type of modulation to be applied to the RF output signal.
9. PULSE RATE control adjusts the repetition rate of the RF output pulse or square wave when the MOD SELECTOR is set to INT or SQ WAVE. The X1 or X10 positions of the SYNC SELECTOR determines the multiplying factor to be applied to the reading of the calibrated PULSE RATE dial.
10. PULSE DELAY control adjusts the time delay between the leading edge of the SYNC OUT pulse and the RF output pulse from 3 to 300 microseconds when the MOD SELECTOR is set to INT.
11. PULSE WIDTH control adjusts the width of the RF output pulse from 0.5 to 10 microseconds when the MOD SELECTOR is set to INT.
12. SYNC SELECTOR switch is used to select the type of synchronization to be employed by the signal generator during internal pulse modulation of the RF output signal.
13. RF OUTPUT: M band type WR-75 waveguide, cover type flange.
14. DELAYED SYNC OUT connector is the output for delayed sync pulses in either square-wave or pulse operation. These pulses are controlled by PULSE DELAY.
15. SYNC OUT connector is the output for sync pulses in either square-wave or pulse operation.
16. SYNC IN connector is the input for sync pulses. These pulses are used only when MOD SELECTOR is set to INT and SYNC SELECTOR to EXT-, EXT + or ∿.
17. EXT MOD/SWEEP OUT: This connector is used as an input for external modulation signals when MOD SELECTOR is set to EXT FM, EXT- or EXT+. The connector is also used as an output for a sweep signal which occurs only when MOD SELECTOR is set to INT FM.

Figure 3-1. Operating Controls and Connectors

# SECTION III
# OPERATING INSTRUCTIONS

## 3-1. INTRODUCTION.

3-2. This section contains instructions for the various modes of operation; each is covered in the operating procedure, paragraph 3-6. Front panel controls and connectors and their uses are shown in Figure 3-1.

## 3-3. HARMONICS.

3-4. At output levels between -50 and +10 dBm, harmonics in the RF output are at least 20 dB below the fundamental frequency. Normally harmonics will not degrade measurements such as determining sensitivity of tuned receivers or tuned systems. However, when measuring standing wave ratios, accuracy can be increased by using a low-pass filter which suppresses second and third harmonics. A low-pass filter with a broad stop band, such as the HP Model M362A is recommended.

3-5. The signal generator attenuator will affect only the fundamental frequency, and therefore harmonics can be identified.

## 3-6. OPERATING PROCEDURE.

3-7. The operation of the Model 626A consists of adjusting the two major sections: the RF section, and the modulator section. Adjust the RF section first, since this adjustment establishes the output power reference level, for the output attenuators.

3-8. After turning the instrument on, allow it at least 5 minutes to reach a stable operating temperature. If the ambient temperature is below 10°C (50°F) a longer warmup period is necessary.

Note

The klystron tube used in this instrument is expensive and has a shorter life than that of the conventional vacuum tube. When the MOD SELECTOR switch is set to OFF, filament and plate voltages are still present on the klystron tube, and therefore power should be removed from the instrument when it is not in use in order to increase the useful life of the tube. Average tube life approximates 1000 hours and the warranty period approximates 500 hours.

3-9. CW OUTPUT.

a. Set frequency dial for desired frequency output.

b. Set MOD SELECTOR to OFF, and adjust ZERO SET to obtain a power-monitor meter indication exactly on the ZERO SET index.

c. Set MOD SELECTOR to CW, and adjust PWR SET to obtain a meter indication exactly on the POWER SET index (red line at center of scale).

d. Set OUTPUT ATTEN for the desired RF output level in dBm as indicated on the calibrated attenuator scale.

3-10. SQUARE-WAVE OUTPUT.

a. After obtaining the desired CW level as described in paragraph 3-9, set MOD SELECTOR to SQ WAVE.

b. Set SYNC SELECTOR to the X1 or X10 position, and adjust PULSE RATE to obtain the desired square-wave frequency.

c. A synchronizing pulse coincident with the rise of each cycle of square wave is available at the SYNC OUT connector on the front panel.

3-11. INTERNAL PULSE MODULATION.

a. After obtaining the desired CW level as described in paragraph 3-9, set MOD SELECTOR to INT.

b. Set SYNC SELECTOR to X1 or X10, and adjust PULSE RATE to obtain the desired pulse repetition rate.

c. Adjust PULSE WIDTH to obtain the desired width of RF output pulse.

d. Adjust PULSE DELAY to obtain the desired delay between the leading edge of the RF output pulse and synchronizing pulse obtained at SYNC OUT.

e. To synchronize any external equipment, use the SYNC OUT and/or DELAYED SYNC OUT pulses.

3-12. EXTERNAL PULSE MODULATION.

a. After obtaining the desired CW level as described in paragraph 3-9, set MOD SELECTOR to EXT + or EXT- to match the polarity of the external modulating pulse.

b. Connect the modulating pulse to EXT MOD connector. The modulating pulse must have an amplitude of at least 15 volts peak.

3-13. INTERNAL FM AT LINE FREQUENCY.

a. After obtaining the desired CW level as described in paragraph 3-9, set MOD SELECTOR to INT FM and SYNC SELECTOR to ∿.

b. Set FM AMPLITUDE control to the full counter-clockwise position, then advance it slowly to establish the desired degree of RF frequency deviation about the center frequency. If the control is advanced too far, the modulating voltage may drive the klystron out of the desired mode of oscillation.

3-14. To observe a presentation of the mode pattern, connect the RF output through a detector to the vertical plates of an oscilloscope and the SWEEP OUT signal to the horizontal plates of the oscilloscope. This method of viewing the mode pattern is recommended when adjusting the reflector-tracking potentiometers.

3-15. EXTERNAL FM.

a. After obtaining the desired CW level as described in paragraph 3-9, set MOD SELECTOR to EXT FM.

b. Connect the external frequency modulation signal to the EXT MOD connector. The modulating signal must have an amplitude of 20 to 30 volts rms.

c. Set FM AMPLITUDE control to the full counter-clockwise position, then advance it slowly to establish the desired degree of FM about the center frequency. If the control is advanced too far, the modulating voltage may drive the klystron out of the desired mode of oscillation. The FM PHASE control cannot be used to control the phase of modulating signals supplied from an external source.

3-16. To observe a presentation of the mode pattern, connect the RF output through a detector to the vertical plates of an oscilloscope and connect the external frequency modulation signal to the horizontal plates of the oscilloscope.

# SECTION IV
# PRINCIPLES OF OPERATION

## 4-1. INTRODUCTION.

4-2. The Model 626A contains five main circuit sections and a regulated power supply. The five main circuit sections, and all front panel controls and connectors are shown in block diagram, Figure 4-2. These circuits provide FM, CW, squarewave, and pulse modulated signals in the 10- to 15.5-GHz range.

## 4-3. PULSE SECTION.

4-4. This section generates all pulses for internal modulation and synchronizing external equipment. The circuits of the pulse section are shown in Figure 4-3, and explained in the following paragraphs. The time relationship between pulses is shown in Figure 4-1.

4-5. INPUT AMPLIFIER AND PULSE RATE MULTIVIBRATOR.

4-6. The functions of input amplifier and pulse rate multivibrator V9 are dependent upon the position of the SYNC SELECTOR switch. Refer to Figure 4-4.

a. With SYNC SELECTOR switch S2 at position 1 (∿) or 2 (EXT+), V9 is an input amplifier for sine waves and positive pulses, and with S2 at position 3 (EXT-), V9 is an input inverter amplifier for negative pulses.

(1) In position 1 or 2, the input signal is applied to the grid of V9A and the grid of V9B is grounded through capacitor C22. The output signal, in phase with the input signal, is taken from the plate of V9B and couples to V10 which is arranged as a Schmitt Trigger.

(2) In position 3, the input signal is applied to the grid of V9B and the grid of V9A is grounded through capacitor C22. The output signal, 180° out of phase with the input signal, is taken from the plate of V9B and coupled to V10.

b. With S2 in positions 4 (X1) and 5 (X10), V9 becomes a free running multivibrator. The frequency of oscillation is determined by time constants of the RC networks and a variable positive voltage towards which the grids are returned.

(1) In position 4 (X1) frequency of oscillation is from 40 to 400 pps and the RC network consists of C16-R35 and C20-R42.

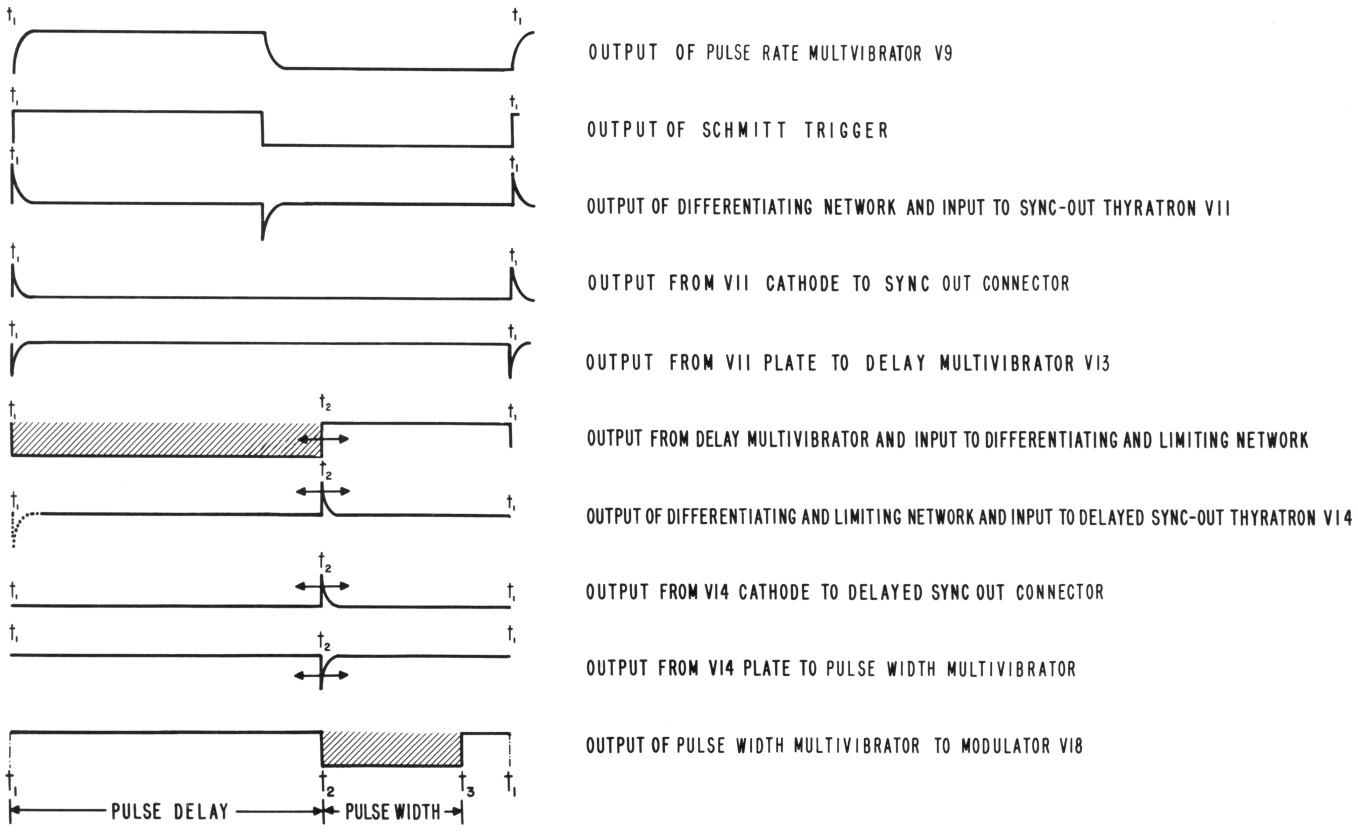



Figure 4-1. Timing Sequence in Pulse Section

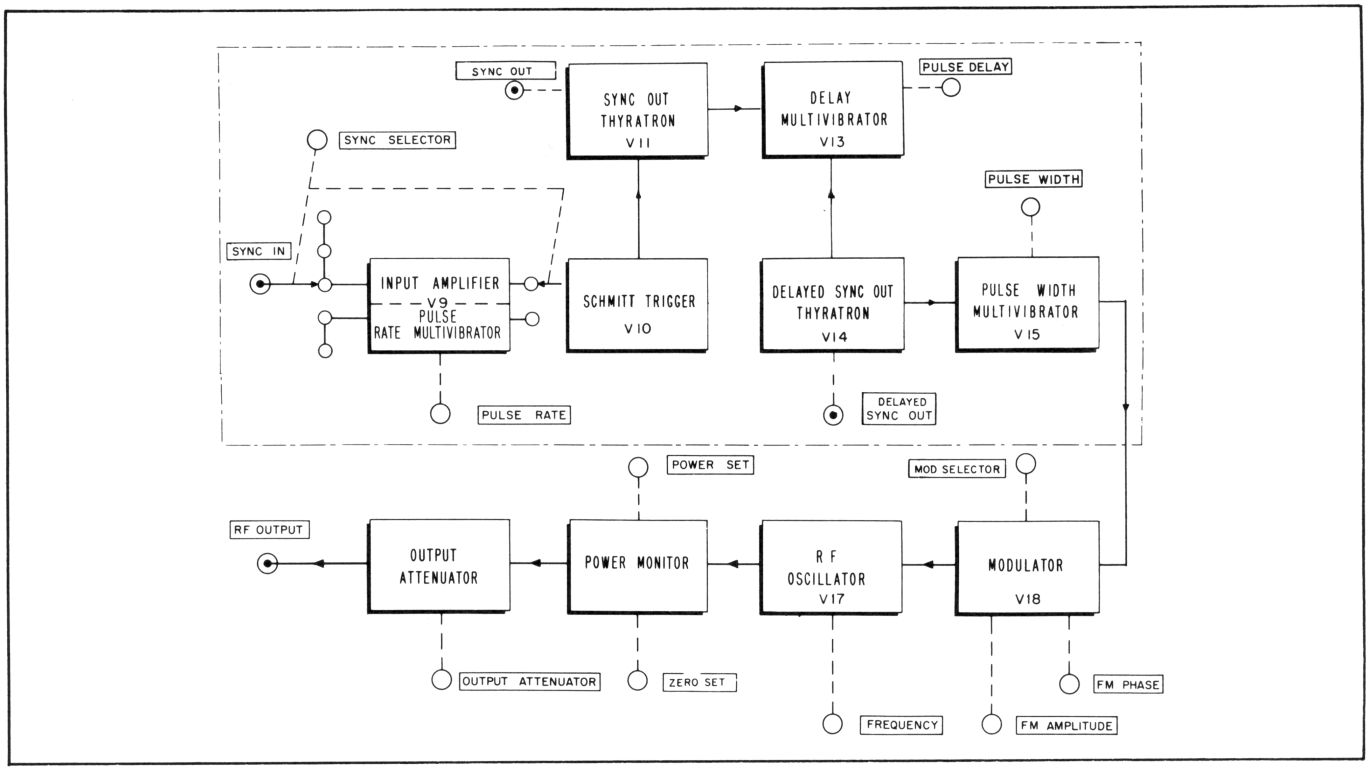



Figure 4-2. Block Diagram

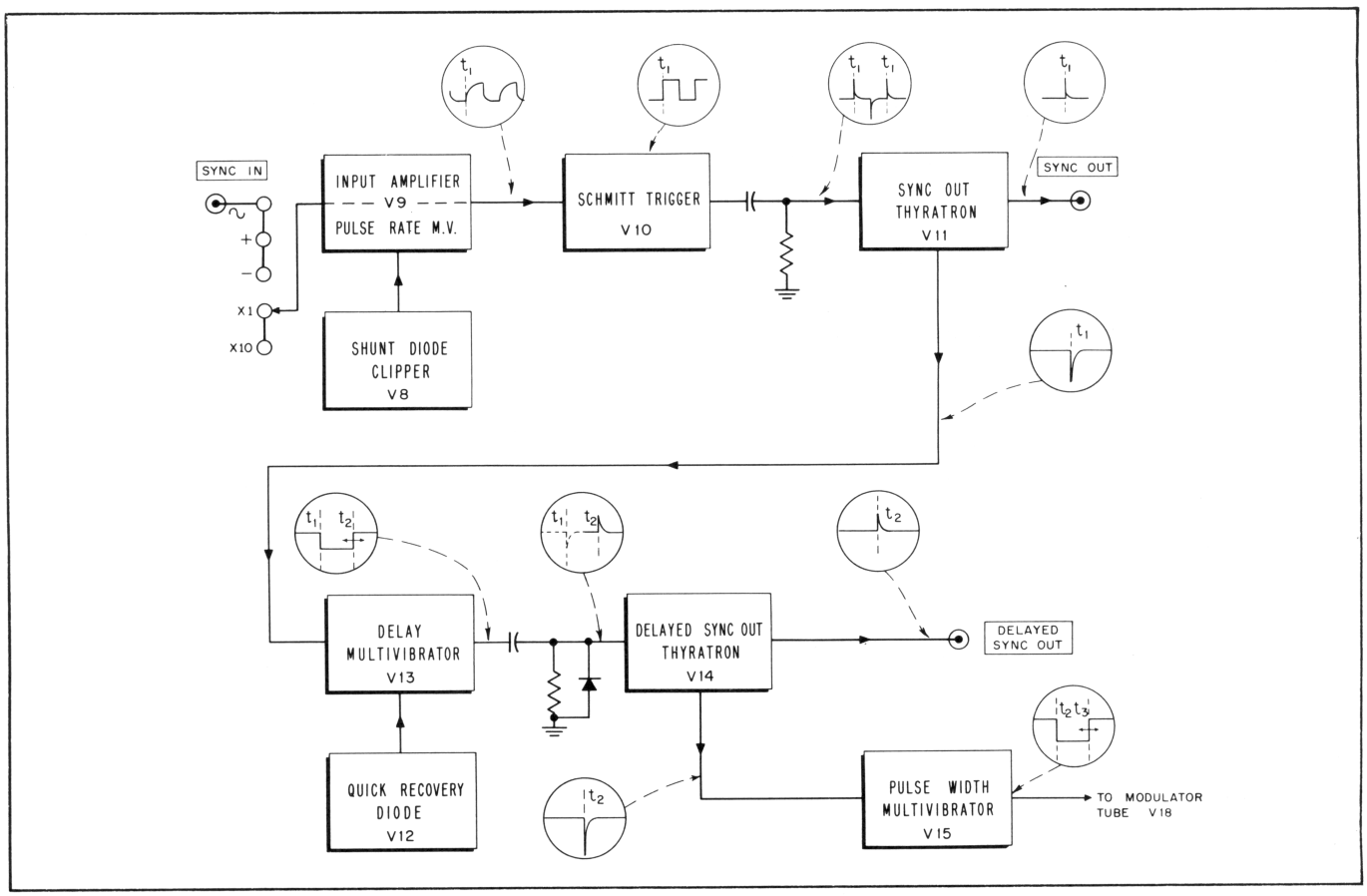



Figure 4-3. Block Diagram of Pulse Section Showing Waveforms

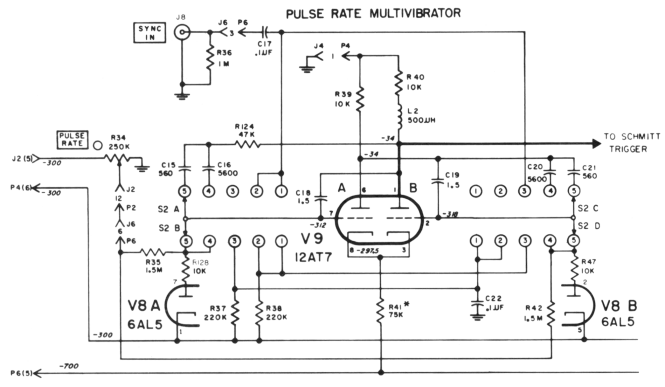



Figure 4-4. Input Amplifier and Pulse Rate Multivibrator

(2) In position 5 (X10) frequency of oscillation is from 400 to 4000 pps and the RC network consists of C15-R35 and C21-R42. Note that C15 and C21 are one-tenth the capacity of C16 and C20, and thus the RC time in the X10 position is one-tenth of that in the X1 position, giving a frequency multiplication of ten.

4-7. PULSE RATE control, R34, varies the voltage towards which the timing capacitors tend to discharge, hence the time it takes the instantaneous grid voltage to reach cut off value in the discharge period of the RC networks.

4-8. The two sections of V8 act as clamping diodes which prevent V9 grids from drawing grid current on their positive swing. Both diodes are clamped to -300 volts and they conduct whenever the instantaneous grid voltages go positive with respect to -300V. This action prevents any transients from appearing in the plate circuits, thereby improving the output waveform.

4-9. The output signal taken from the plate of V9B is coupled, by capacitor C23, to the grid of V10A.

4-10. SCHMITT TRIGGER.

4-11. A pulse of fast rise and decay time is required for triggering thyratron V11. Therefore the output from V9 is passed through a schmitt trigger circuit before being applied to sync out thyratron V11. The schmitt trigger circuit is shown in Figure 4-5.

4-12. Transition from one state to the other in a schmitt trigger circuit (a direct coupled multivibrator) is very fast, which results in a square wave output of sharp waveform. V10 reverses conduction when the rise of the input signal reaches an upper trigger level, and again when the decay of the input signal goes through a lower trigger level. These trigger levels are established by the change in potential in the common cathode circuit which results from the difference in conduction through two sections of V10. The upper trigger level is established when V10B is conducting and is approximately -223 volts. The hysteresis of the circuit is 10-11 volts which places the decaying trigger level at approximately -233 volts when V10A is conducting.

4-13. The voltage divider composed of R43, R44, R45, and R46 establishes the no-signal level on the V10A grid below the lower trigger level or at approximately -234 volts.

4-14. Maximum sensitivity of the schmitt trigger is obtained when the average DC level of the input signal is so set that the signal is symmetrical with respect to the two trigger levels. The average DC level at the input to V10 is raised or lowered by adjustment of Trigger Level Adj. (R44), which in turn adjusts the duty cycle of the square-wave output.

4-15. The signal which will be used for square-wave modulation is provided by the schmitt trigger. To avoid loading the output of V10B, the square-wave modulating voltage is taken from the plate of V10A, and is coupled to modulator V18 when MOD SELECTOR switch S3 is in SQ WAVE.

4-16. The output signal is taken from the plate of V10B for triggering thyratron V11.

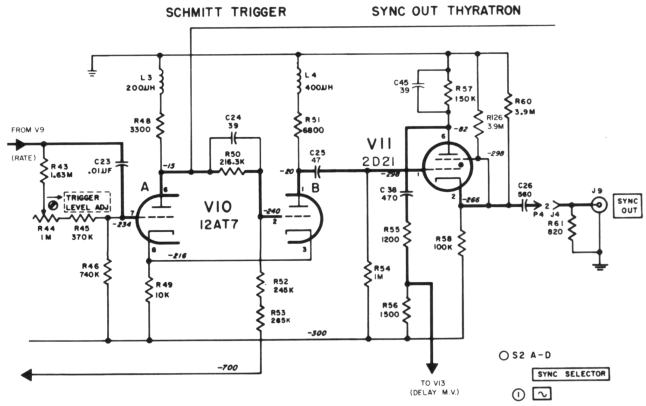



Figure 4-5. Schmitt Trigger and Sync Out Thyratron

4-17. SYNC OUT THYRATRON.

4-18. The output of V10B is differentiated by C25 and R54. The sharp positive spike fires sync out thyratron V11 (Figure 4-5) by driving its grid positive. A large negative pulse (-130 volts peak) is developed in the plate circuit of V11 and is fed through C38 and R55 to delay multivibrator V13. A positive pulse (30 volts peak) appears at the cathode of V11 and is fed to the SYNC OUT connector through C26. This sync signal is simultaneous in time with the front of the original pulse established by the pulse rate multivibrator or by an external source of sync signals. The time relationships are indicated in Figure 4-1.

4-19. DELAY MULTIVIBRATOR.

4-20. Delay multivibrator V13 (Figure 4-6) produces an output pulse whose width is variable from 3 to 300 $\mu$s with respect to its leading edge $t_1$, see Figure 4-1. Its trailing edge establishes time reference $t_2$. The width of the output pulse is controlled by setting PULSE DELAY control, R80.

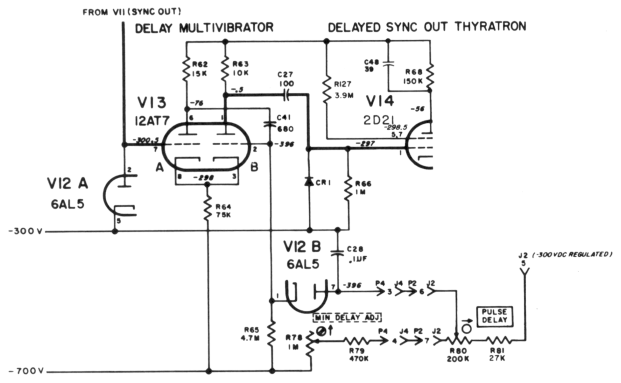



Figure 4-6. Delay Multivibrator

4-21. Delay multivibrator V13, is arranged as a one-shot multivibrator, with a diode clamp in each of its grid circuits. Diode V12A clamps V13A grid to prevent it from going more positive than -300 volts. Diode V12B clamps V13B grid to prevent it from going more negative than a level determined by the setting of the PULSE DELAY control, a level which is somewhere below cut-off. Under no-signal conditions V13A is conducting, V13B is cut off, and V12B is conducting. When the circuit is in the no-signal condition, the potential on V13B grid is established through V12B and is essentially the same as the potential on V12B plate.

4-22. When the large negative pulse from V11 is applied to the grid of V13A, conduction in V13A ceases, and the positive signal developed in the plate of V13A is coupled to the grid of V13B through timing capacitor C41. V13B conducts, V12B cuts off, and C41 discharges through R65 towards -650 volts, pulling the grid of V13B more negative until cutoff is reached. V13A then starts to conduct, and the negative signal developed in the plate of V13A is coupled to the grid of V13B, driving the V13B grid negative from cutoff by an amount equal to the plate swing of V13A. Diode V12B starts to conduct, C41 discharges through V12B, and the V13B grid is returned to the no-signal condition in a very short time. Waveforms shown in Figure 4-7 illustrate the decrease in recovery time obtained by use of grid clamp V12B.

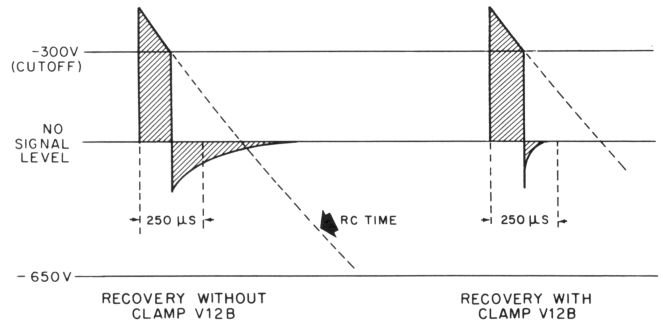



Figure 4-7. Waveform Comparison

4-23. Rapid return of V13B grid to the no-signal level is required so that the delay multivibrator will be prepared to receive the next pulse incoming from V11. Since at high pulse repetition rates the period between pulses is short (250 $\mu$s at 4000 pps), interaction would occur if grid recovery time is short.

4-24. The relation between changes in grid level and pulse width is indicated in the waveform diagram Figure 4-8. The width of the output pulse is dependent upon two things: the RC time constant of C41-R65 and the level of potential on the V13B grid when the delay multivibrator is in the no-signal condition. While the RC time can not be varied, the level of potential on the V13B grid can be raised or lowered by changing PULSE DELAY control. For example, when PULSE DELAY is set so that the no-signal level on V13B grid is approximately -390 volts, the positive pulse from V13A will drive V13B grid very little above cutoff, conduction time of V13B will be brief, and therefore the width of the output pulse will be greatly shortened.

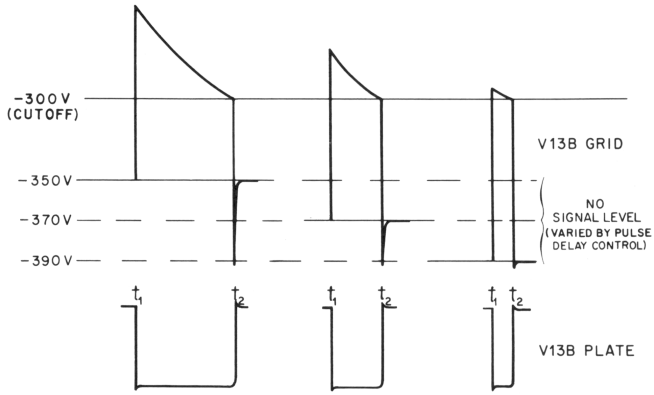



Figure 4-8. Delay Multivibrator Grid and Plate Waveforms

4-25. With PULSE DELAY at minimum, variable resistor R78 adjusts the minimum interval between the leading ($t_1$) and trailing ($t_2$) edges of the output pulse, thus effecting minimum delay of the RF output pulse with respect to $t_1$.

4-26. The output of V13B is differentiated by C27 and R66, and the negative spike, corresponding to $t_1$, is eliminated through diode CR1. The positive spike, representing time reference $t_2$, is passed to delayed sync out thyratron V14.

4-27. DELAYED SYNC OUT THYRATRON.

4-28. The action of delayed sync out thyratron V14 (Figure 4-9) is similar to that described for sync out thyratron V11 (paragraph 4-17). The positive differentiated spike from V13 fires the thyratron. The positive pulse (30-volt peak) developed in the V14 cathode circuit is fed to the DELAYED SYNC OUT connector, and the large negative pulse developed in the V14 plate circuit is coupled to width multivibrator V15.

4-29. PULSE WIDTH MULTIVIBRATOR.

4-30. The action of pulse width multivibrator V15 (Figure 4-9) is similar to that of delay multivibrator

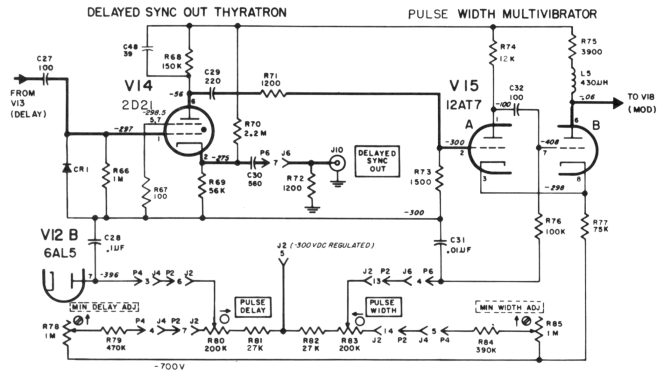



Figure 4-9. Delayed Sync Out Thyratron and Pulse Width Multivibrator

V13 (paragraph 4-19) except that there is no diode in the V15B grid circuit to shorten recovery time. Normal recovery time is adequate to return the circuit to the no-signal condition before the next pulse is received from V14.

4-31. Bias for the V15B grid is applied through a voltage divider, R82-R85, which includes variable resistor R83, brought out to the front panel as the PULSE WIDTH control. The relation between level of grid potential and width of output pulse was discussed in paragraph 4-24. The pulse width multivibrator provides an output pulse whose width is variable from 0.5 to 10 $\mu$s. The trailing edge of the V15B output pulse establishes time reference $t_3$, see figure 4-1. With pulse width at minimum, variable resistor R85 adjusts the minimum interval between the leading ($t_2$) and trailing ($t_3$) edges of the output pulse, thus effecting minimum width of the RF output pulse with respect to $t_2$.

4-32. The V15B output pulse is coupled to the grid of V18B in the modulator section when the MOD SELECTOR switch is set to INT.

## 4-33. MODULATOR SECTION.

4-34. The modulator section (Figure 4-10) includes modulator tube V18 and MOD SELECTOR switch S3. This section receives all pulse and square-wave modulation signals to be applied to the RF oscillator section. The modulator tube functions only in positions 4, 5, 6, and 7 of S3. In positions 1 and 2 FM signals are applied to the klystron reflector. In position 3 no modulation signal is applied to the klystron, thus the RF output signal is a continuous wave. Circuit conditions at each position of S3 are as follows:

a. Position 1 (EXT FM) -- An externally-supplied FM signal, applied at the EXT MOD/SWEEP OUT connector, is placed across variable resistor R115 (FM

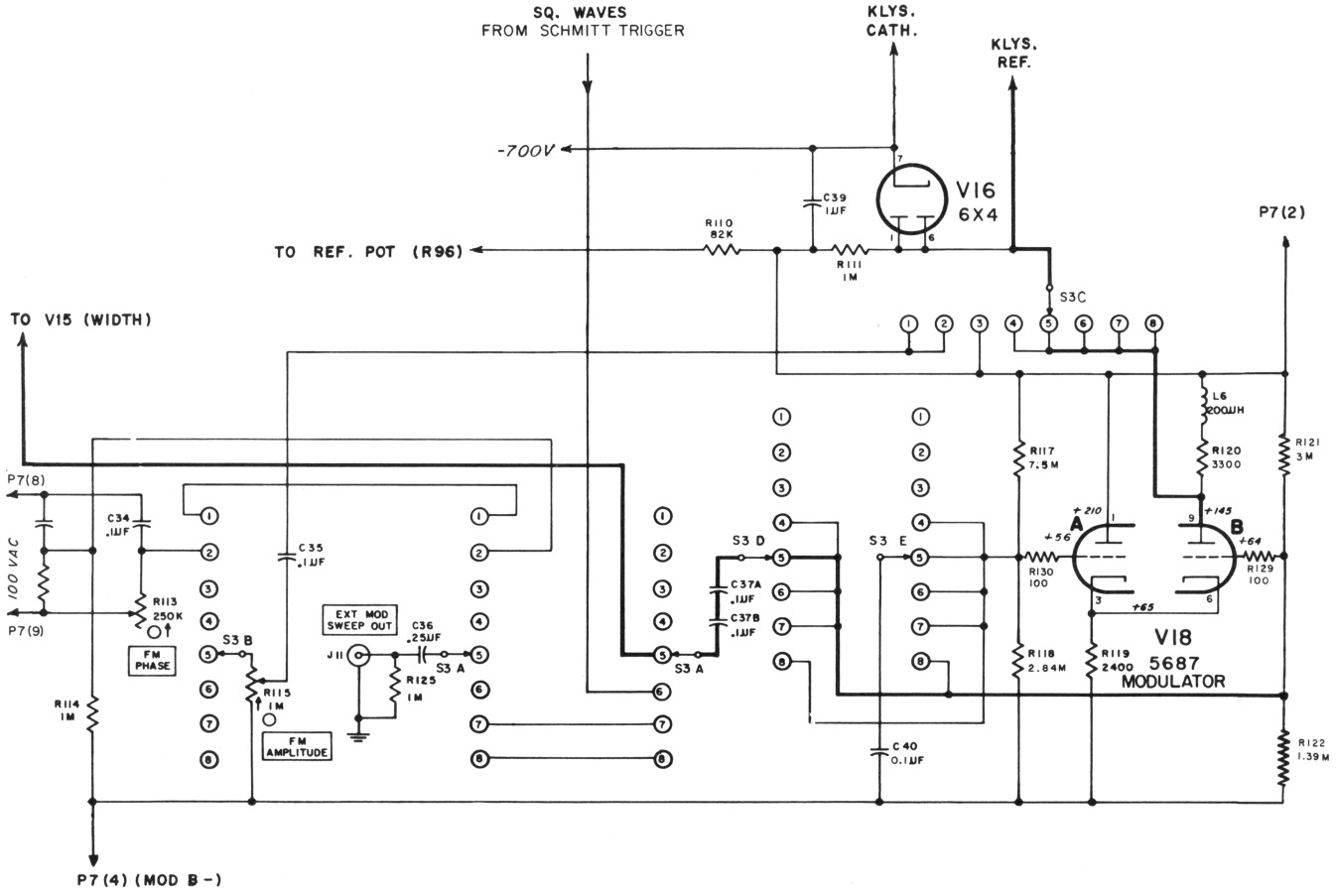



Figure 4-10. Modulator V18 and MOD SELECTOR Switch S3

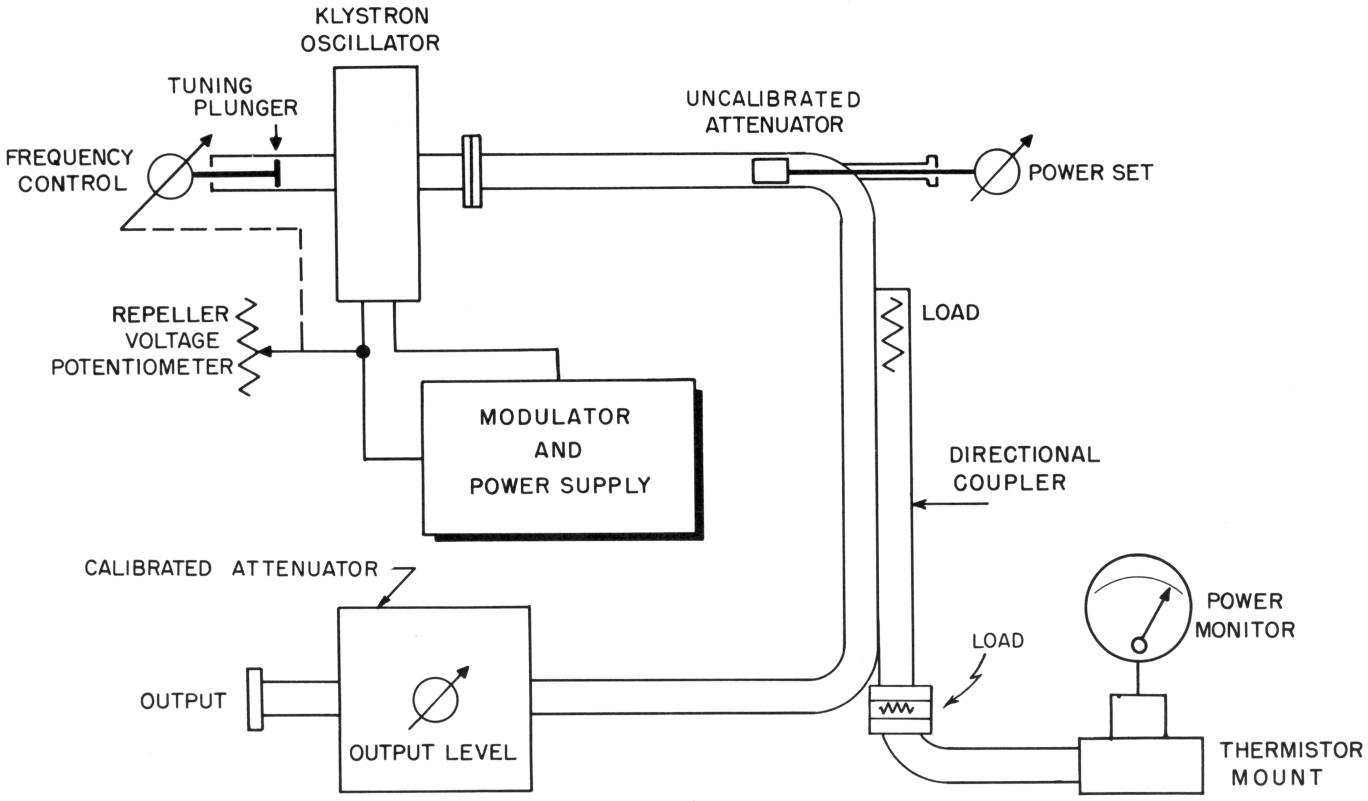



Figure 4-11. RF Oscillator and Waveguide System

AMPLITUDE control), and then coupled by capacitor C35 to the klystron reflector.

b. Position 2 (INT FM) -- An internally-supplied FM signal of the same frequency as the line voltage is placed across R115 (FM AMPLITUDE control), and then coupled to the klystron reflector. This signal, taken from secondary winding B of power-supply transformer T2 by leads P7 (8) and P7 (7), is applied to the modulator section through a phase-determining network which includes the FM PHASE control. The FM signal voltage is also supplied to the EXT MOD/SWEEP OUT connector.

c. Position 3 (CW) -- In this position modulation is not applied to the klystron reflector and the RF output signal generated by the RF oscillator is a continuous wave.

d. Position 4 (OFF) -- In this position the klystron reflector is tied to the plate of V18B. With the modulator section in the no-signal condition, V18A is cut off and V18B is conducting. The drop across the V18B plate load resistor (approximately 60 volts) drives the reflector outside the operating mode, and there is no oscillation.

e. Position 5 (INT) -- In this position, modulating voltage is supplied from width multivibrator V15. In the no-signal condition the circuit is as described for position 4. When a negative pulse from V15 is placed on its grid, V18B cuts off. Potential on the V18B plate rises, returning the klystron reflector to the operating level, and the klystron oscillates. Oscillation continues for the duration of the pulse, and then the V18 circuit returns to the no-signal condition, again driving the klystron reflector outside the operating mode.

f. Position 6 (SQ WAVE) -- The square-wave signal, from the V10A section of the schmitt trigger is placed on the V18B grid. As described for position 5, the resulting action alternately changes the klystron reflector voltage so that the klystron moves in and out of oscillation.

g. Position 7 (EXT-) -- The action in this position is identical to that described for position 5 except that the negative pulses that are applied to the modulator section are supplied from an external source at the EXT MOD/SWEEP OUT connector.

h. Position 8 (EXT+) -- The action in this position is similar to that described for position 7 except that externally-supplied pulses are applied to V18A grid. V18A conducts, V18B cuts off and allows the klystron to oscillate. In the EXT+ position V18 acts as a pulse inverter.

4-35. The action of diode V16 protects the klystron from drawing reflector current. V16 is connected across the cathode and the reflector, and conducts in the event the klystron reflector goes positive with respect to the klystron cathode.

## 4-36. RF OSCILLATOR SECTION.

4-37. The RF oscillator section (Figure 4-11) of the Model 626A is essentially an all waveguide system,

employing a reflex klystron tube mounted in a plunger tuned cavity for generation of the RF energy. The energy from the cavity is coupled to a power set attenuator (uncalibrated) which adjusts the power level applied to the calibrated attenuator. The level at the input of the calibrated attenuator is monitored by a compensated thermistor bridge which operates a front panel meter. Monitoring is accomplished by sampling the RF energy through a waveguide directional coupler which feeds the sampled RF energy to a thermistor located in one leg of the bridge. The calibrated attenuator is a rotary type, operating in circular waveguide with a transition to rectangular waveguide at its output.

## 4-38. REFLEX KLYSTRON OPERATION.

4-39. The resonant circuit of the RF oscillator includes klystron resonator-grid capacitance, beam admittance, and the primarily inductive impedance of the external cavity. The cavity is fitted with a movable plunger which changes cavity dimensions, thereby varying the impedance of the oscillator resonant circuit. With a change in impedance, the frequency of oscillation is changed.

4-40. Figures 4-13a and 4-13b show equivalent circuits of a reflex klystron oscillator. In the following discussion of how oscillations are sustained in a reflex klystron oscillator, the presence of a low amplitude RF voltage across the resonator grids is assumed. As in any oscillator, this initial voltage is supplied by the thermal agitation noise.

4-41. Electrons emitted from the cathode toward the resonator grids are velocity modulated, i.e., the electrons are accelerated or decelerated according to the phase of the RF voltage existing across the resonator grids. After leaving the resonator grids, the electrons encounter a retarding electric field set up by the negative reflector voltage and are repelled back toward the grids. Since the electrons have been velocity modulated they tend to form in bunches when they arrive at the grids.

4-42. This bunching of electrons is illustrated in Figure 4-12, which shows the transit time relationship of electrons while in the drift space between the resonator grids and the reflector. Consider an electron (a) leaving the grids at time $t_1$. The voltage of the RF signal on the grids is such that the electron receives energy and is accelerated into the drift space. It arrives back at the grids at time $t_n$. An electron (b) leaving at time $t_2$ receives no acceleration because the RF signal is now at zero volts. Thus electron (b) does not travel as far into the drift space and arrives back at the grids at the same time as electron (a). Electron (c) leaving at time $t_3$ is decelerated since the RF signal has reversed voltage polarity since time $t_1$. Electron (c) travels a shorter distance into the drift space and arrives back at the grids at the same time as electrons (a) and (b).

4-43. When bunched electrons arrive back at the grids at a time when the RF signal tends to retard their return, they deliver energy to the grids and sustain oscillations in the resonant cavity.

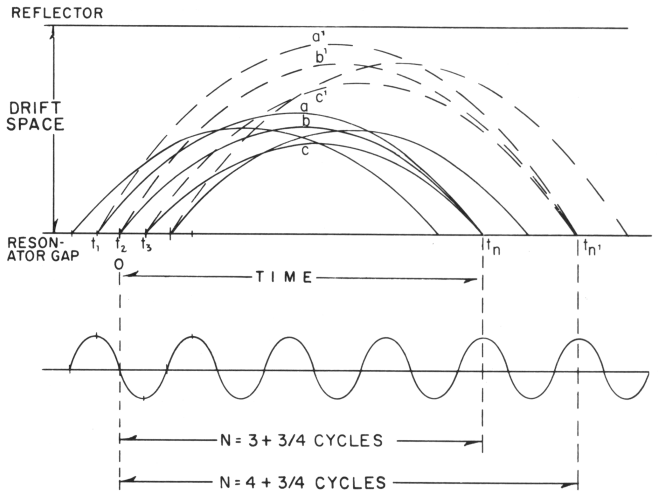



Figure 4-12. Bunching of Electrons in a Reflex Klystron

4-44. The time that the electrons spend in the drift space is adjusted by changing the reflector voltage. As reflector voltage is increased in the negative direction, electrons a, b, and c spend less time in the drift space. As reflector voltage is decreased electrons $a^1$, $b^1$, and $c^1$ (Figure 4-12) travel farther into the drift space and take a longer time ($t_n1$) to return to the grids. At the low end of the frequency band (10.0 to 12.8 GHz.), the reflector voltage is adjusted so that the number of oscillations (N) that occur at the grid while the electrons are in the drift space is equal to 3-3/4 cycles. At the high end of the frequency band (12.8 to 15.5 GHz.), the reflector voltage is adjusted so that the number of oscillations equals 4-3/4 cycles. When the oscillator is operating with 3-3/4 cycles drift time it is known as operating in the 3-3/4 reflector mode. A plot of reflector modes with respect to frequency and reflector voltage is given in Figure 4-14.

## 4-45. RF OSCILLATOR TUBE.

4-46. The RF oscillator tube is a Varian type V39B reflex klystron operating in a tunable cavity resonator. The klystron and cavity assembly are shown in Figures 5-4a and 5-4b. The klystron is constructed with two irises located opposite each other and near the resonator grids. One iris looks into the external cavity and the other into the output system.

4-47. The klystron cavity system in the Model 626A operates on the 3/4 wavelength cavity mode, and oscillation of both the 3-3/4 and 4-3/4 reflector modes are employed to cover the frequency band from 10.0 to 15.5 GHz. The 3-3/4 mode is used from 10.0 GHz to approximately 12.8 GHz. At this frequency the tuning mechanism actuates mode switch S4 to decrease the voltage applied to the reflector by approximately 250 volts. This action places the system on the 4-3/4 mode for the remainder of the band from approximately 12.8 to 15.5 GHz.

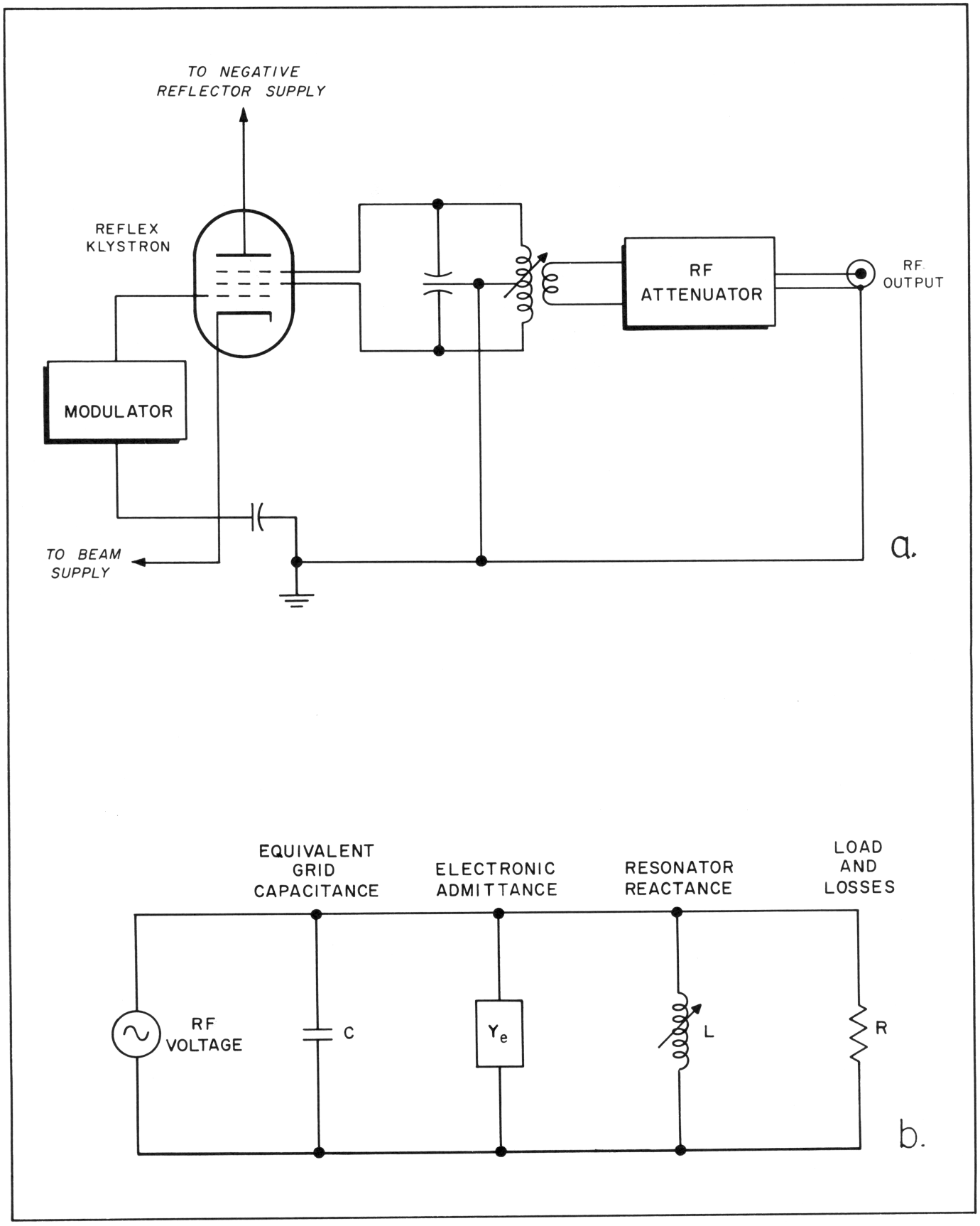



Figure 4-13. Equivalent Circuits of RF Oscillator

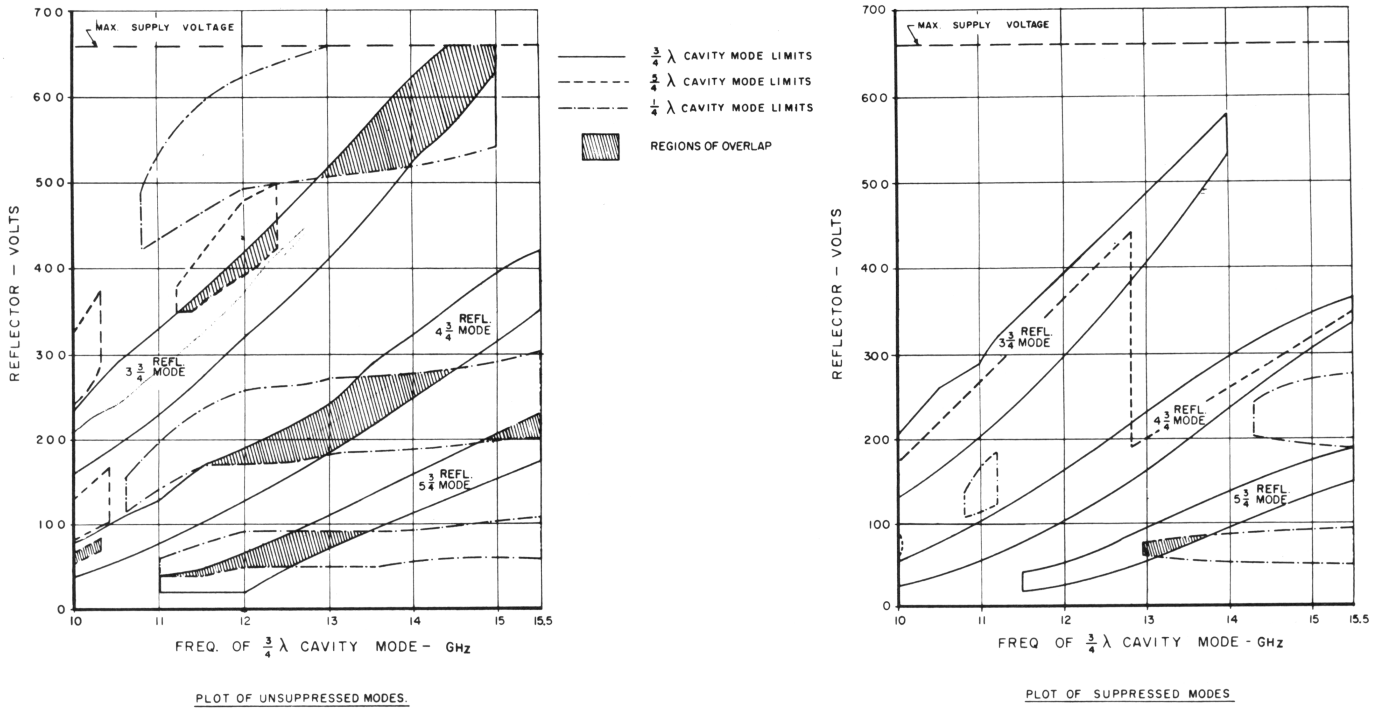



Figure 4-14. Graph Showing Klystron Oscillation Modes

4-48. As shown in the plot of modes, Figure 4-14, the 5/4 wavelength cavity mode interferes with the 3-3/4 reflector mode at the lower end of the band. This mode is suppressed by means of two tapered loads adjoining the cavity, parallel to the plunger, and by an adjustable load in the klystron cavity. The mode suppressors are shown in Figure 5-13. Since klystrons possess a natural tendency to oscillate on the 1/4 wavelength cavity mode, and since this mode is undesirable, it is suppressed by the use of a small cylindrical load coupled to the cavity; a small screw matches the cavity to this load. The matching screw is effectively shorted out of the circuit at approximately 11 GHz and below by a shorting switch actuated by a cam on the frequency-drive shaft (Figure 5-13).

4-49. Voltage is applied to the klystron reflector from variable resistor R96. The movable arm of R96 is ganged to the frequency drive in such manner that voltage on the reflector is automatically tracked with frequency in the desired reflector mode.

## 4-50. POWER-MONITOR SECTION.

4-51. The power-monitor section monitors the RF power level at the input to the calibrated attenuator (OUTPUT ATTEN DBM). The power-monitor section includes an uncalibrated attenuator (PWR SET) which adjusts the level of power applied to the calibrated attenuator, and a thermistor bridge which monitors the power applied to the calibrated attenuator. Refer to Figure 4-15.

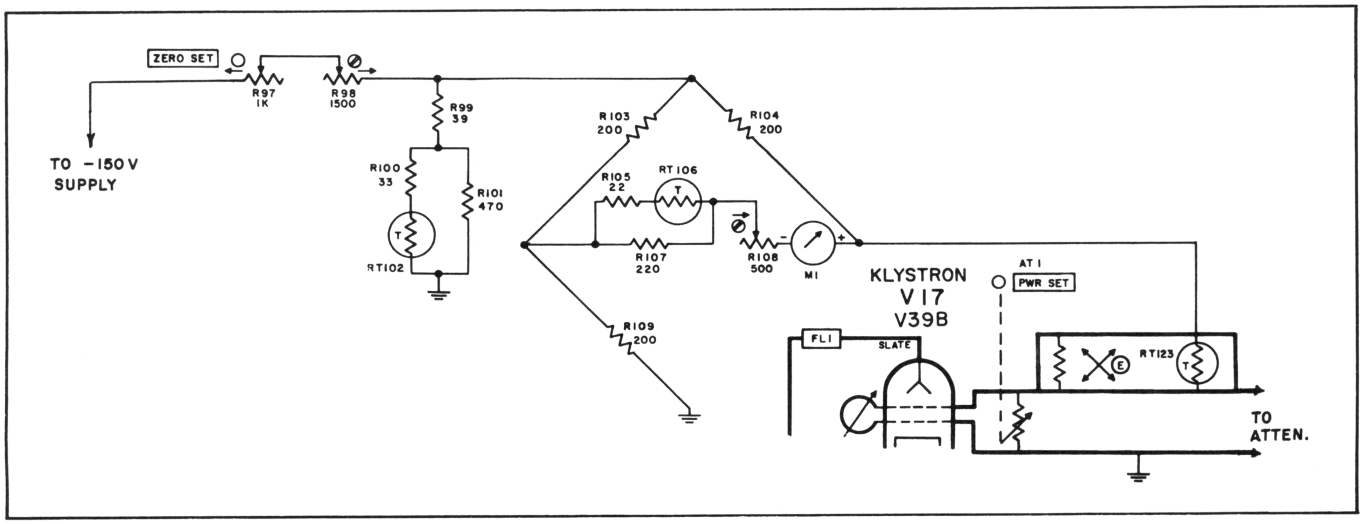



Figure 4-15. Power-Monitor Section

4-52. RF power from the klystron is coupled to the uncalibrated attenuator which is brought out to the front panel as the PWR SET control. Power from the uncalibrated attenuator is coupled directly to the calibrated attenuator. Power delivered to the calibrated attenuator is sampled by a specially-designed directional coupler and applied to one leg of the temperature-compensated thermistor bridge (RT123). Power-monitor meter M1 is connected across the bridge and when the bridge is balanced the meter reads ZERO SET. To bring the bridge into balance adjust the ZERO SET control. If the bridge is balanced before the power is sampled and when the sampled power causes the meter to read 0 dBm, the power level at the input to the calibrated attenuator is +10 dBm (10 mW).

4-53. Thermistor RT106 connected in series with the meter acts as a sensitivity-regulating device, necessary because of the characteristic of thermistor bridges to increase in sensitivity as the ambient temperature increases. Thermistor RT102 in the network shunted across the bridge is a temperature-compensating device. Since RT123 is temperature sensitive, the bridge could drift appreciably from its zero setting with changes in ambient temperature. RT102 compensates for this tendency. With changes in the voltage across the bridge, current through thermistor RT102 also changes, and its resistance varies in such manner as to regulate the current through RT123. The regulation of current through RT123 tends to keep the bridge in balance by counteracting any change in current through RT123 due to ambient temperature changes. Thus the bridge can be zero-set and will remain in balance to a relatively high degree.

## 4-54. OUTPUT ATTENUATOR SECTION.

4-55. The output attenuator section consists essentially of two broadband, precision waveguide attenuators operating in series and ganged to the OUTPUT ATTEN DBM control. The OUTPUT ATTEN is calibrated to read the output in dBm.

4-56. Each attenuator consists of three sections of waveguide in tandem. In each section a resistive film is placed across the guide as shown in Figure 4-16. The middle section is a short length of round guide which is free to rotate axially with respect to the two fixed end sections. The end sections are rectangular-to-round waveguide transitions in which the resistive films are normal to the E field of the applied wave. The construction is symmetrical.

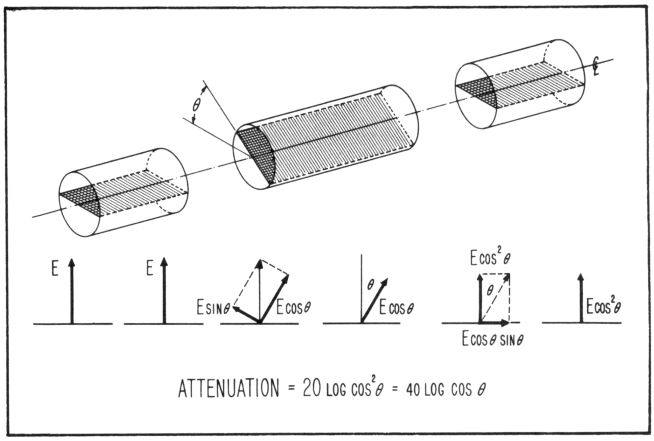



Figure 4-16. Phantom View Showing Output Attenuator

4-57. When all films are aligned, the E field of the applied wave is normal to all films and no attenuation occurs. When the center section is rotated through an angle θ, the E field may be considered as resolved into two components: E sin θ in the plane of the film and E cos θ normal to the plane. The E sin θ component will be absorbed by the film while the E cos θ component, now oriented at an angle θ with respect to the applied wave, will be passed unattenuated to the third section. When it encounters the third film, the E cos θ component will be split into two components: the E cos θ sin θ component which will be absorbed by the film, and the E $\cos^2$ θ component which will emerge with orientation identical to the original wave.

4-58. The attenuation is thus a function only of the angle to which the center section is rotated and is almost completely independent of frequency. In terms of dB the attenuation is equal to 40 log cos θ. Attenuation through both attenuator sections in series is twice the attenuation through one of them, i.e. [2 (40 log cos θ)], and attenuation up to 100 dB may be introduced.

# SECTION V
# MAINTENANCE

## 5-1. INTRODUCTION.

5-2. This section provides maintenance and service information for the Model 626A SHF Signal Generator. The section includes recommended test equipment, replacement procedures for tubes, repair and adjustment procedures, and troubleshooting charts. Also included are performance checks which verify proper instrument operation.

## 5-3. CLEANING THE AIR FILTER.

5-4. The air filter for the Model 626A is located behind the louver on the front panel. Inspect the air filter regularly, and clean it before it becomes dirty enough to restrict air flow. To remove and clean the air filter, proceed as follows:

a. Remove filter from instrument front panel by removing the four machine screws at the corners.

b. Wash filter in warm water and detergent.

c. Dry filter thoroughly and coat it with filter adhesive. We recommend Super Filter Coat from Research Products Corporation. This adhesive comes in a convenient spray can and is available from most heating supply stores or from your authorized Hewlett-Packard sales representative HP Part No 3150-0002).

## 5-5. TEST EQUIPMENT.

5-6. Test equipment required for use in maintaining and checking performance of the Model 626A is listed in Table 5-1. Equipment having similar characteristics can be substituted for the equipment listed.

## 5-7. TROUBLESHOOTING.

5-8. LOCATING TROUBLE.

5-9. Always start locating trouble with a thorough visual inspection for burned-out or loose components, loose connections, or any condition which suggests a source of trouble. Check tubes for open filaments by touching tubes and replace all that are cold. Replacing a cold tube, in most cases, will restore the generator to normal operation. Check the fuse to see that it's not open.

5-10. If trouble cannot be isolated to a bad component by a visual inspection or a cold tube, the trouble should then be isolated to a circuit section. Isolation to a circuit section can best be accomplished by using block diagram, Figure 4-2.

5-11. TROUBLESHOOTING CHARTS.

5-12. Troubleshooting charts, Tables 5-2, 5-3, and 5-4, list checks and symptoms, possible causes, and remedies of various troubles. The power supply should be checked first; refer to paragraph 5-14.

5-13. For simplification, only tubes are referenced in the troubleshooting charts, but it should be remembered that components associated with referenced tubes are also failure possibilities. When testing the signal generator it is recommended that line voltage be applied through a variable transformer, and that the transformer be adjusted to deliver a voltage at the low end of the rated 103- to 127-volt range. An instrument in good condition should operate satisfactorily from any line voltage within the rated range, but where there is marginal operation (from weak tubes, etc), weaknesses become easier to trace at low line voltages.

## 5-14. POWER SUPPLY.

5-15. Correct operation of the power supply is vital to proper operation of the signal generator. Noise or variation in the regulated voltages causes other circuits to operate in a random or erratic manner. It is advisable to make a voltage check of the power supply whenever the instrument is suspected of marginal operation. This eliminates factors such as low voltages or poor regulation which cause unsatisfactory performance in other sections of the instrument.

5-16. The power supply section consists of three interdependent electronically-regulated voltage supplies, furnishing -300, -700, and -1250 volts as measured from chassis ground and an unregulated supply furnishing - 210 volts.

a. The -300 volt regulated supply furnishes voltage for operation of the pulse generator. It also furnishes a regulated -150 volts for the power-monitor bridge. This voltage is taken from an additional voltage regulator tube (V3), included between chassis ground and the -300 volt supply.

b. The -400 volt regulated supply, stacked with the -300 volt supply, furnishes -700 volts (beam supply) to the klystron cathode and pulse circuits.

c. The -550 volt regulated supply, stacked with the -300 and -400 volt supplies, furnishes -1250 volts (reflector supply) to the klystron reflector.

5-17. The separate supplies and their relationships are shown in a block diagram, Figure 5-1. The regulated supplies are stacked, and voltage regulator tube V7 in the -550 volt supply furnishes the reference voltage for the whole supply.

5-18. After the instrument is turned on, there is a 30-second delay before the -300 and -400 volt supplies are energized, which permits tube filaments to heat before klystron beam voltage and tube potentials are applied. Thermal relay K1 in the power supply input holds the transformer T1 primary circuit open for 30 seconds after power is applied.

Table 5-1. Required Test Equipment

| Instrument Type | Required Characteristics | Use | Recommended Model |
|---|---|---|---|
| Oscilloscope | Internal Sweep: 0.5 μsec/cm to 100 μsec/cm | Signal tracing, calibration and performance checks | HP Model 160B |
| Audio Oscillator | Frequency Output: 1000 Hz | Calibration | HP Model 200AB |
| Pulse Generator | Pulse Duration: 5 μsec<br>Output Voltage: 5 volts peak<br>Repetition Rate: 4000 pps | Adjustments | HP Model 212A |
| Vacuum Tube Voltmeter | AC Voltage Range: 1 mV to 10 volts<br>DC Voltage Range: to 700 volts positive and negative | General purpose and adjustments | HP Models 400D/H and 410B |
| Microwave Power Meter | Power Range: to 10 mW<br>Scale to read in dBm and milliwatts | Adjustments and performance checks | HP Model 430C |
| Crystal Detector | Sensitivity: 0.05 V/mW<br>Frequency Response: ±2 dB<br>Frequency Range: 10 to 15.5 GHz | Signal tracing, calibration and performance checks | HP Models M421A and P421A |
| Thermistor Mount | Power Range: to 10 mW<br>Frequency Range: 10 to 15.5 GHz | Adjustments, calibration and performance checks | HP Models M487B and P487B |
| Frequency Meter | Dial Calibration Accuracy: 0.07%<br>Frequency Range: 10 to 15.5 GHz | Calibration and performance checks | HP Models M532A and P532A |

Table 5-2. Power Supply Troubleshooting

| Symptom | Possible Cause | Remedy |
|---|---|---|
| -550 VOLT SUPPLY | | |
| With voltmeter common lead connected to -700 volt terminal, connect positive lead to -1250 volt terminal to read -550 volts. | | |
| Small deviation | Out of adjustment | Adjust R28 (Fig. 5-2) to -550 volts |
| Low voltage | Defective series regulator V5<br>Defective rectifier diode | Replace V5; adjust R28 above<br>Replace CR12, 13, 14, or 15; adjust R28 above |
| High voltage | Defective control tube V6 | Replace V6; adjust R28 above |
| Erratic voltage | Defective reference tube V7 | Replace V7; adjust R28 above |
| -400 VOLT SUPPLY | | |
| With voltmeter common lead connected to -700 volt terminal, connect positive lead to -300 volt terminal to read +400 volts. | | |
| Low voltage | Defective series regulator V1<br>Defective rectifier diode | Replace V1<br>Replace CR6, 7, 8, or 9 |
| High voltage | Defective control tube V4 | Replace V4 |
| -300 VOLT SUPPLY | | |
| With voltmeter common lead connected to -700 volt terminal, connect positive lead to chassis ground to read +700 volts. | | |
| Low voltage | Defective series regulator V1<br>Defective rectifier diode | Replace V1<br>Replace CR2, 3, 4, or 5 |
| High voltage | Defective control tube V2 | Replace V2 |
| -150 VOLT BRIDGE SUPPLY | | |
| Connect voltmeter terminals between chassis and pin 2 of V3 to read -150 volts. | | |
| Voltage unstable | Defective V3<br>Defective -300 volt regulation | Replace V3<br>Adjust -300 volt supply |

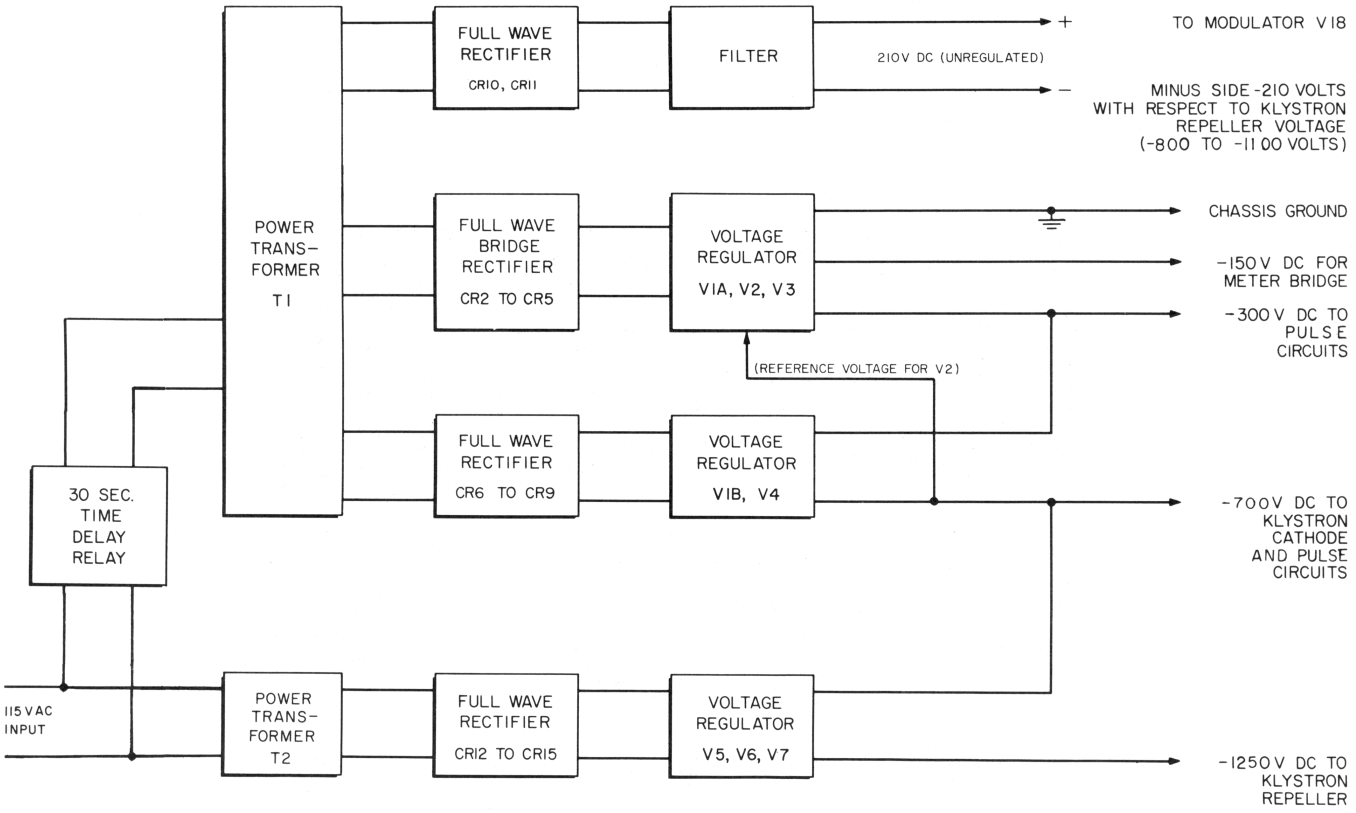



Figure 5-1. Block Diagram of Power Supply

5-19. It will be noticed in the schematic diagram of the power supply, Figure 5-20, that V6, the control tube for the -700 volt supply, has a divided plate load consisting of R21 and R25-R26. R21 acts as the plate load before the thermal relay is actuated while R25-R26 act as the plate load after the relay trips.

5-20. When measuring voltages in power supply, the procedure given in Table 5-2 should be followed. This permits the voltmeter common to be attached to -700 volt bus at all times, while the dc probe is moved from point to point. Use of polarity switch on the voltmeter will be required only when measuring +700 and +400 volts to chassis ground.

WARNING

When measuring voltages from points on the regulator card which have dc potential to ground, use a plastic encased multimeter. When using metal case vtvm's exercise great care since metal cabinets will be at high negative potentials.

5-21. Adjust line voltage from 103 to 127 volts while measuring output voltages from the regulated supply. The regulated voltages may vary ±1% with this line voltage change.

## 5-22. REPAIR.

5-23. CABINET REMOVAL.

5-24. To remove Model 626A from its cabinet proceed as follows:

a. Position instrument so that it is resting on front panel guard rail handles.

b. Remove four screws on the back of the cabinet, and lift the cabinet from instrument chassis.

5-25. TUBE REPLACEMENT CHART.

5-26. Tubes used in Model 626A are listed in Table 5-5. Any tube may be replaced with a tube having corresponding RETMA standard characteristics. When tube replacement requires that an adjustment be performed, Table 5-5 references paragraph or table where pertinent adjustment information is given. It is recommended that tubes be checked by substituting new tubes of the same type; if no improvement in performance is noted, return original tube to the socket.

5-27. SERVICING ETCHED CIRCUIT BOARDS.

5-28. To service etched circuit boards the following steps are recommended.

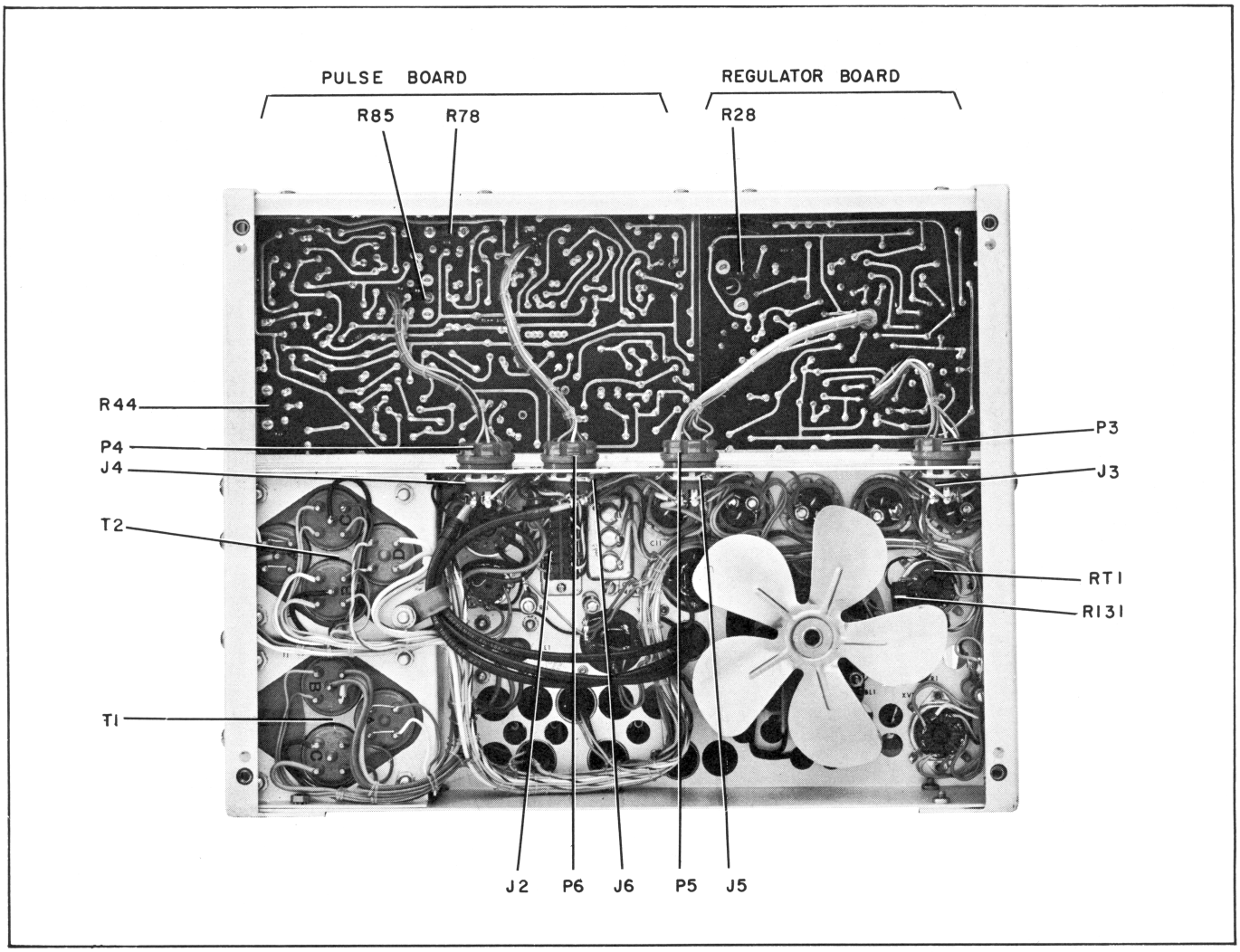



Figure 5-2. Rear View of Instrument Showing Power Supply and Pulse Sections

Table 5-3. RF Generator Troubleshooting

| Symptom | Possible Cause | Remedy |
|---|---|---|
| With MOD SELECTOR set to OFF | | |
| Power-monitor meter not indicating | No supply voltage | Measure bridge supply voltage across end tap (orange lead) R98 (Figure 5-7) and ground; should be approximately 2 to 3 volts. Check -150 volt supply. |
| | Defective VR tube V3 | Replace V3; readjust ZERO SET (para 5-41) |
| | Open meter | Disconnect meter; check continuity. Caution: 200 μA movement |
| Power-monitor meter pins upscale or downscale | Shorted or open component on one side of bridge causing unbalance | Disconnect one side of meter. Measure bridge supply voltage at R98 (see remedy step above) for 2 to 30 volts. Measure voltage between each side of bridge and ground to determine side at fault. The voltage at both midpoints on each side of the bridge should be 1/2 voltage applied to bridge from R98. |
| Power-monitor meter pins to left below zero | Open thermistor RT123 | Replace thermistor mount. Recalibrate power-monitor meter (para 5-59) |

Table 5-3. RF Generator Troubleshooting (cont'd)

| Symptom | Possible Cause | Remedy |
|---|---|---|
| With MOD SELECTOR set to OFF (cont'd) | | |
| Power-monitor meter pins to right upscale | High bridge voltage; defective VR tube V3 | Replace V3 |
| | Shorted thermistor mounting-post insulator. (One post is insulated from mounting by mica washer which also acts as bypass capacitance.) | It is recommended that entire mount be replaced because of difficulties in adjusting mount frequency response after reinsulating post (para 5-59) |
| With MOD SELECTOR set to CW | | |
| Power-monitor meter indicates weak output | Incorrect tracking adjustments | Check reflector tracking adjustments (para 5-50). Observe mode patterns. |
| | Defective klystron | Replace klystron, cavity, and frequency drive mechanism (para 5-29) |
| | Extraneous material in cavity (braid, filings, polyiron chips, etc) | Remove foreign matter |

a. Do not apply excessive heat.

b. Remove a damaged component by clipping leads near component.

c. Apply heat to component lead and remove lead with a straight upward pull.

d. Use a toothpick or wooden splinter to clean holes.

e. Solder replacement components from the conductor side.

5-29. KLYSTRON TUBE REPLACEMENT.

5-30. If it is necessary to replace the klystron tube, the klystron cavity and frequency drive mechanism must be replaced as a unit. Replacement unit (HP Part No. 626A-95A) consists of a new klystron installed in

Table 5-4. Pulse Section Troubleshooting

| Symptom | Possible Cause | Remedy |
|---|---|---|
| No RF output with MOD SELECTOR set to INT or SQ WAVE. INT FM and CW positions satisfactory | Defective V8, V9, or V10 | Replace; see Table 5-5 |
| | Schmitt trigger sensitivity out of adjustment | Adjust R44; see para 5-43 |
| No RF output with MOD SELECTOR set to INT and no SYNC OUT or DELAY SYNC OUT pulses. SQ WAVE position satisfactory | Defective V11 | Replace; see Table 5-5 |
| No RF output with MOD SELECTOR set to INT and no DELAY SYNC OUT pulse. SYNC OUT pulse and SQ WAVE positions satisfactory | Defective V12, V13, V14 | Replace; see Table 5-5 |
| | Min. delay adj. misadjusted | Adjust R78; see para 5-57 |
| No RF output with MOD SELECTOR set to INT. SYNC OUT pulse, DELAY SYNC OUT pulse and SQ WAVE positions satisfactory | Defective V15 | Replace; see Table 5-5 |
| | Min. width adj. misadjusted | Adjust R85; see para 5-58 |
| No RF output with MOD SELECTOR set to INT or SQ WAVE. SYNC OUT pulse, DELAY SYNC OUT pulse and INT FM and CW positions satisfactory | Defective V18 | Replace; see Table 5-5 |

Table 5-5. Tube Complement

| Tube | Type | Function | Adjustment Reference |
|---|---|---|---|
| V1 | 6080 | Series Regulator (-300 volt supply and -400 volt supply) | Table 5-2 |
| V2 | 6AU6 | Control Tube (-300 volt supply) | Table 5-2 |
| V3 | OA2 | Voltage Reference Tube (-150 volts) PWR SET bridge supply | Paragraph 5-59 |
| V4 | 6AU6 | Control Tube (-350 volt supply) | Table 5-2 |
| V5 | 6AQ5 | Series Regulator (-550 volt supply) | Table 5-2 |
| V6 | 6AU6 | Control Tube (-550 volt supply) | Table 5-2 |
| V7 | 5651 | Reference Tube (-550 volt supply) | Table 5-2 |
| V8 | 6AL5 | Clamping Diode | No adjustment required |
| V9 | 12AT7 | Pulse Rate Multivibrator and Input Squaring Amplifier | Paragraph 5-55 |
| V10 | 12AT7 | Schmitt Trigger | Paragraph 5-43 |
| V11 | 2D21 | Sync Out Thyratron | No adjustment required; selection may be necessary, however. |
| V12 | 6AL5 | Clamping Diode | No adjustment required |
| V13 | 12AT7 | Pulse Delay Multivibrator | Paragraph 5-57 |
| V14 | 2D21 | Delayed Sync Out Thyratron | No adjustment required |
| V15 | 12AT7 | Pulse Width Multivibrator | Paragraph 5-58 |
| V16 | 6X4 | Limiting Diode | No adjustment required |
| V17 | V39B | Klystron Oscillator | Paragraph 5-45 |
| V18 | 5687 | Modulator | No adjustment required |

a cavity which is attached to the associated frequency drive mechanism. A new calibrated frequency dial is also included with the unit. Units are completely pretested and adjusted at the factory. Field installation of the replacement unit is simple and requires no extensive readjustment procedure. Units can be obtained from the factory on an exchange basis by contacting the nearest Hewlett-Packard field representative or factory service department.

CAUTION

THE STOPS FOR THE FREQUENCY DRIVE MECHANISM ARE INOPERATIVE WHEN FREQUENCY DIAL IS NOT IN PLACE. ROTATING THE SHAFT FOR THE FREQUENCY DIAL AND FREQUENCY DRIVE CAM TO ONE EXTREME OR THE OTHER WITHOUT THESE STOPS MAY RESULT IN SERIOUS AND PERMANENT DAMAGE TO PLUNGER ON INNER END OF FREQUENCY DRIVE ROD. HANDLE WITH CARE.

5-31. PRIOR TO REMOVAL. Before removing klystron cavity and frequency drive mechanism, the PWR SET attenuator must be withdrawn from klystron cavity; failure to do this will result in a broken attenuator. To prevent damage to attenuator, proceed as follows:

a. Rotate PWR SET maximum clockwise.

b. In Figure 5-10, locate power set atten. drive in upper left hand corner of picture. Loosen allen setscrews that hold large gear in attenuator drive.

c. Locate collar on attenuator drive shaft (parallel with panel) and gently pull this collar away from large attenuator drive gear until it stops. Power set attenuator card will now be clear of klystron cavity and you may proceed with klystron removal.

d. After klystron assembly has been installed, slide attenuator shaft back toward large drive gear making sure setscrew on collar is on top.

e. With PWR SET maximum clockwise, press large gear and collar together with your fingers and tighten setscrews on gear.

f. Check operation of PWR SET to make sure it operates smoothly.

5-32. REMOVAL. Refer to Figure 5-3 and proceed as follows:

a. Obtain a scratch awl or similar sharp-pointed tool.

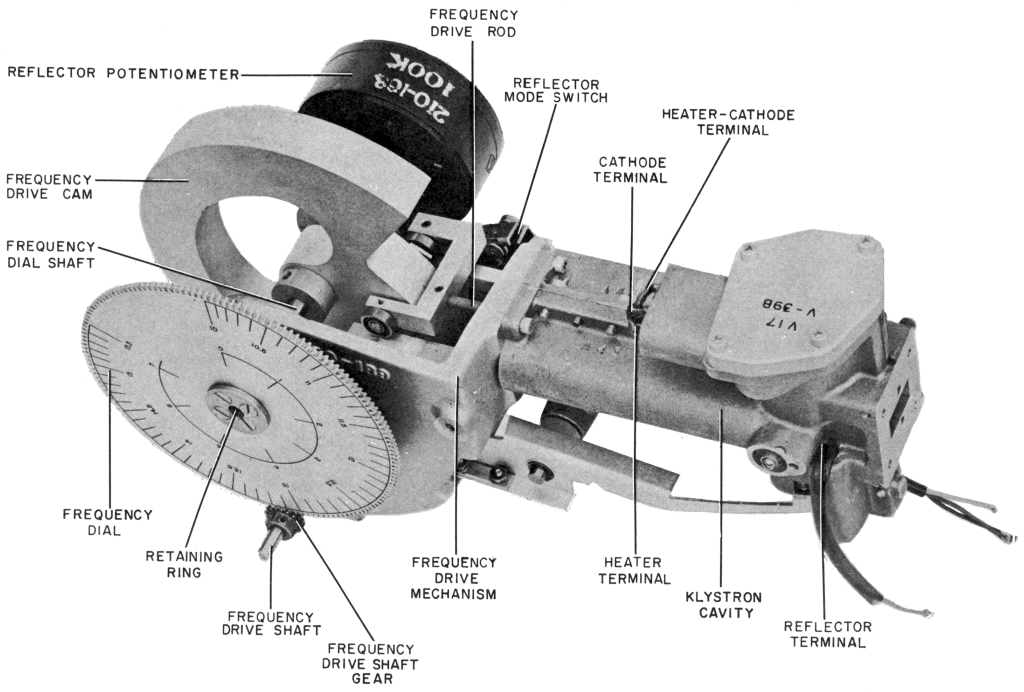



Figure 5-3. View of Klystron Cavity and Frequency Drive Mechanism

b. Rotate frequency control full counterclockwise to stop. Normally a small dot just to the left of 10 GHz. dial point will be under the hair line.

c. Remove and save frequency control knob and cover over frequency dial. This cover is held in place by four screws.

d. With awl, mark a valley on the frequency drive shaft gear and the tooth of frequency dial which meshes in this valley.

e. The dial is held on frequency dial shaft by a retaining ring with four screws. Remove all four screws without permitting frequency dial to rotate with respect to shaft and hub on which it is mounted. Place a short scratch mark across shaft end, dial hub, and a short way onto dial so that all three can be replaced later in exactly the same position. This scratch mark will be found on shaft, dial hub, and dial supplied in the replacement assembly (HP Part No. 626A-95A).

f. Remove dial hub and spring washer over frequency dial shaft. Save spring washer for use in step f under paragraph 5-33, Installation.

g. Note connections to reflector potentiometer by drawing a sketch before disconnecting leads. Disconnect leads.

h. Remove and save three front panel screws that hold frequency drive mechanism onto rear of panel. Tip instrument forward onto guard rail handles at each end of the panel.

i. Remove and save tubes V16 and V18. Note connections for the four wires from klystron cavity and disconnect at terminals adjacent to V16 tube socket.

j. Remove and save four screws holding waveguide section to klystron cavity. Support cavity as last screw is removed to prevent damage to waveguide.

k. Slide klystron cavity and frequency drive assembly to left and lift cavity upward. The entire assembly will now swing to one side to expose the connections to reflector mode switch.

m. Note connections to reflector mode switch by drawing a sketch before disconnecting leads. Disconnect leads.

n. Lift entire assembly from instrument. Observe the CAUTION following paragraph 5-30.

5-33. INSTALLATION. Refer to Figure 5-3, and proceed as follows:

a. Reconnect leads to reflector mode switch. Refer to the sketch made in step m under paragraph 5-32, Removal.

b. Swing klystron cavity and frequency drive mechanism in place on instrument and replace the four screws (removed in step j under Removal) that fasten klystron cavity to waveguide section. Tighten all screws firmly.

c. Reconnect klystron leads. Refer to notes made in step i under Removal. Check connections carefully as an error may result in a burned out klystron. Replace tubes V16 and V18.

d. Hold frequency drive mechanism against back of front panel and turn instrument upright. Insert and tighten one of three screws (saved in step h under Removal) that hold frequency drive mechanism. Insert and tighten remaining two screws.

e. Reconnect leads to reflector potentiometer. Refer to the sketch made in step g under Removal.

f. Replace spring washer (saved in step f under Removal) over end of frequency dial shaft.

g. Install frequency dial hub supplied with new assembly. Align scratch marks on end of shaft and dial hub, push hub back until end of shaft and surface of hub are approximately flush. Tighten setscrews in hub. The shaft must not protrude beyond the front surface of hub.

h. Turn frequency drive shaft gear full counterclockwise. Replace frequency dial and align the mark on gear with the marked tooth on dial. Align scratch mark across dial hub and dial before replacing retaining ring and tightening the four screws.

i. Replace frequency dial cover.

j. Replace frequency control knob on frequency drive shaft.

k. Rotate frequency drive shaft full counterclockwise and hold against stop. Check that the dot on frequency dial is under the hair line.

5-34. ADJUSTMENTS. After replacing the klystron cavity the following adjustments are necessary. Refer to Figure 5-3 and proceed as follows:

a. Connect an ac voltmeter such as an HP Model 400D/H between the heater-cathode terminal and heater terminal.

WARNING

Use an insulated voltmeter. This is necessary due to high voltages applied to the klystron tube. If the voltmeter has a ground lead be sure it is isolated by using a three-prong to two-prong adapter and leave the pigtail floating. Extreme care must be taken to insulate the metal instrument case as it will be at the same potential as the ground clip lead.

b. Connect power cord to proper source and turn Model 626A on.

c. The heater voltage should be 6.3 Vac. If heater voltage is not 6.3 Vac refer to paragraph 5-39.

d. Set Model 626A MOD SELECTOR switch to INT FM.

e. Connect an HP Model 410B VTVM positive lead to the reflector terminal and negative or common lead to the cathode terminal. Voltmeter SELECTOR switch should be set to -.

f. Set potentiometers R89 and R95 (Figure 5-10) to approximate center of range over which they can be rotated. These two controls are located on an insulated bracket mounted on the bottom edge of modulator assembly.

g. Set frequency dial to 10 GHz and adjust control R92 for a voltmeter reading of * ____ volts. Slowly increase frequency setting until the point is reached where reflector mode switch just operates as can be determined by an audible click. At this point adjust R87 for a voltmeter reading of * ____ volts. If either R92 or R87 have insufficient range, adjust control R95 beyond point where desired reading is obtained and then readjust the particular control that originally had insufficient range.

h. Decrease frequency dial setting slightly as required to cause reflector mode switch to operate. At this point, adjust control R88 for a voltmeter reading of * ____ volts. Set frequency dial to 15.5 GHz and adjust control R93 for a voltmeter reading of * ____ volts. If either R88 or R93 have insufficient range, adjust control R89 beyond point where the desired reading is obtained and then readjust the particular control that originally had insufficient range.

i. Repeat steps g and h several times as necessary. These controls all interact but if steps g and h are repeated enough times a point will be reached where additional adjustment will not be necessary.

j. If reflector voltages are carefully set, no additional adjustments will normally be required. To check instrument performance refer to paragraph 5-62.

5-35. To better understand the relationship of parts in the klystron cavity and drive mechanism refer to Figures 5-4 and 5-5.

5-36. REFLECTOR POTENTIOMETER REPLACEMENT.

5-37. To replace reflector potentiometer, R96, refer to Figure 5-6 and proceed as follows:

a. Remove power to instrument.

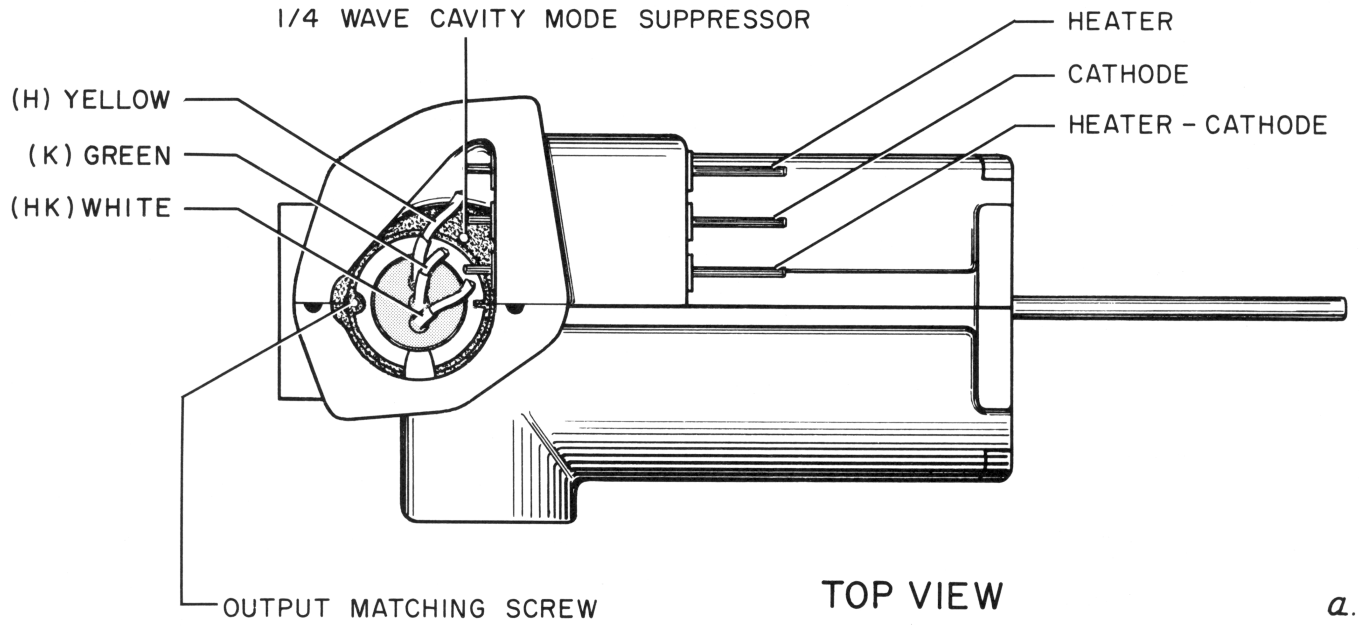
b. Draw a sketch of reflector potentiometer, R96, noting color and location of leads.

c. Remove leads from potentiometer.

d. Remove retaining ring and back of potentiometer. Remove screw holding potentiometer to supporting bracket.

e. Loosen setscrews on mode-switch cam located between cam and potentiometer. DO NOT LOOSEN setscrews between mode-switch cam and frequency drive casting (see Figure 5-6).

*These voltages vary from one klystron to another. Correct voltages will be specified in the instructions sent with each replacement unit.



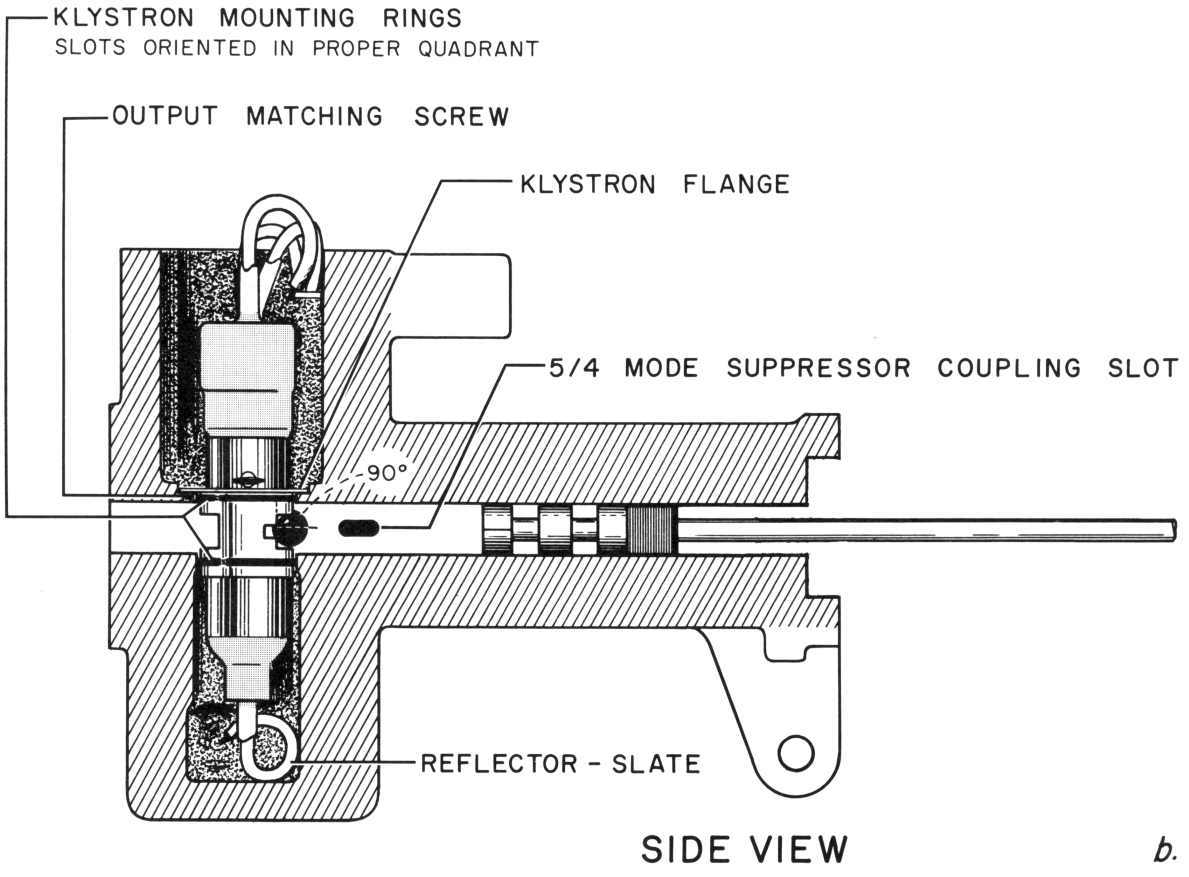




Figure 5-4. Cutaway Views of Klystron Cavity

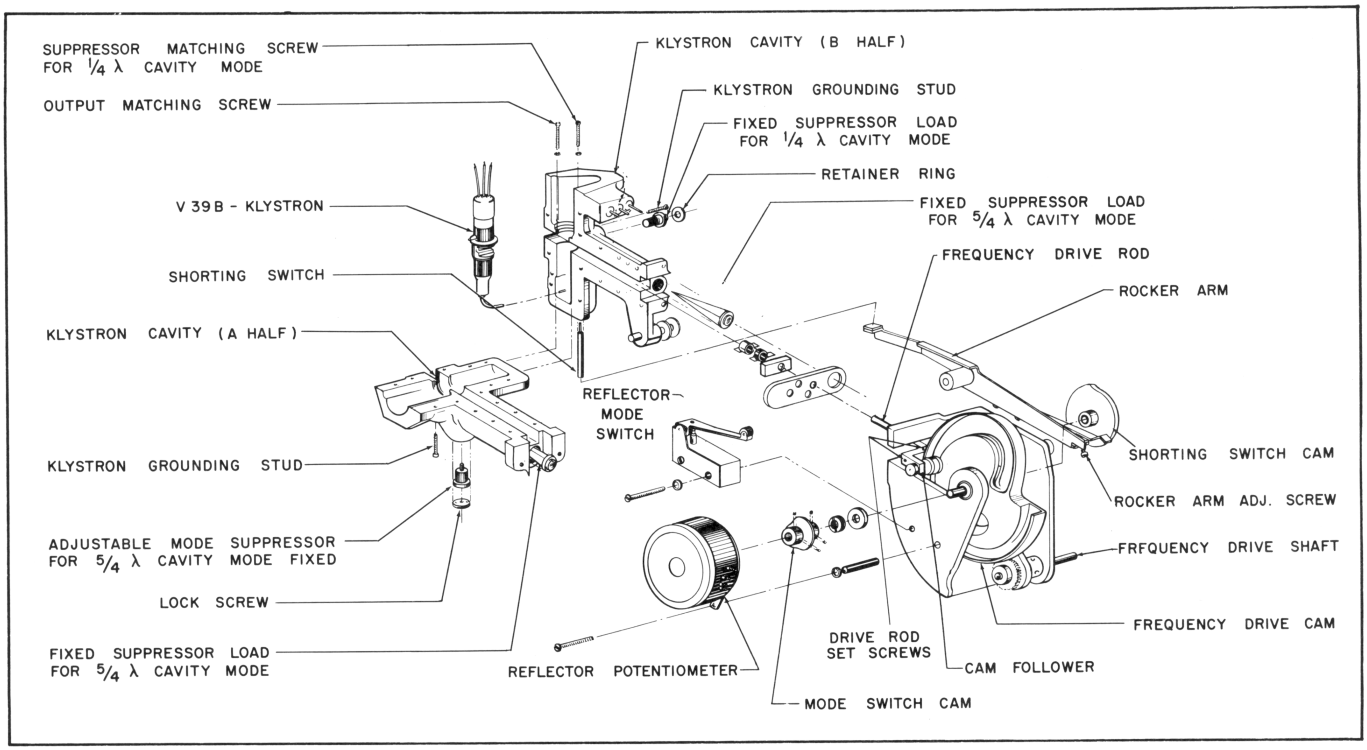



Figure 5-5. Exploded View of Klystron Cavity and Plunger Drive Mechanism

f. Remove reflector potentiometer.

g. Remove back from replacement potentiometer and connect it to supporting bracket with the screw removed in step d.

h. Do not tighten mode-switch cam setscrews at this time.

i. Refer to sketch made in step b and reconnect leads to potentiometer.

j. Connect an ohmmeter set on the X1000 range between the center tap and wiper arm of potentiometer.

k. Position frequency dial to point of mode-switch actuation. Move frequency dial back and forth through the mode-switch lag distance to determine mid-point. Place frequency dial at this mid-point.

m. Hold frequency dial in place and adjust position of wiper arm inside potentiometer until ohmmeter reads minimum resistance.

n. Tighten mode-switch cam setscrews and replace back of potentiometer.

p. If necessary, perform reflector tracking adjustment as described in paragraph 5-51k.

5-38. REPLACING RT1.

5-39. After replacing RT1 the klystron heater voltage should be checked and adjusted if necessary. Refer to Figures 5-2, 5-3, and proceed as follows:

a. Connect an ac voltmeter such as an HP Model 400D/H between the heater-cathode terminal and heater terminal.

b. Voltmeter reading should be 6.3 Vac.

c. If voltmeter reads high, decrease shunt resistance (R131). Increase this resistance if reading is low. Continue to change this resistance until the heater voltage reads 6.3 Vac.

d. Wait 10 minutes and repeat steps a and b. If voltmeter reading is not 6.3 Vac, repeat step c.

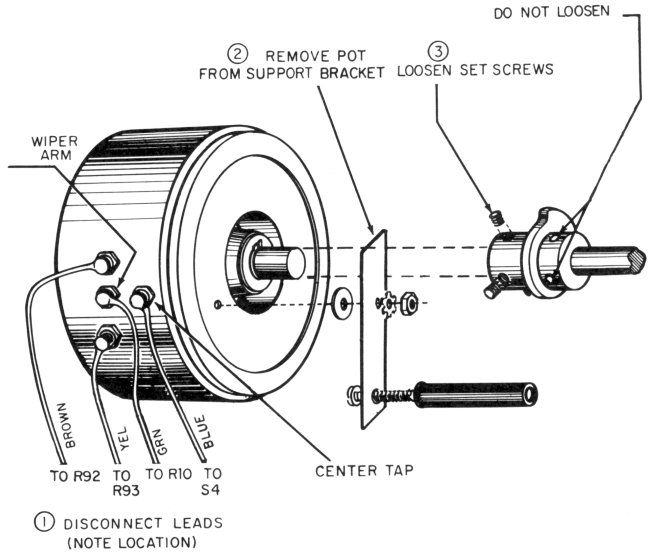



Figure 5-6. Detail Showing Reflector Potentiometer Removal

## 5-40. ADJUSTMENTS.

5-41. ZERO SET CONTROL ADJUSTMENT.

5-42. When front panel ZERO SET control will not zero-set the power-monitor meter, the range of this control needs to be extended. To extend its range, refer to Figure 5-7 and proceed as follows:

a. Set MOD SELECTOR to OFF and position ZERO SET control to its mechanical center.

b. Adjust R98 until power-monitor meter indicates Zero Set.

5-43. SCHMITT TRIGGER LEVEL ADJUSTMENT.

5-44. To adjust schmitt trigger level, refer to Figures 5-2, 5-10, and proceed as follows:

a. Connect test setup as shown in Figure 5-8. Oscilloscope vertical input is to be connected to terminal B GRN on modulator board.

b. Adjust calibrated pulse generator output for 4000 pps. Pulses should be 5 $\mu$sec duration and 5 volts peak. For maximum accuracy, calibrate pulse generator with oscilloscope.

c. Set Model 626A MOD SELECTOR to OFF and SYNC SELECTOR to polarity of external sync pulses uses.

d. Adjust oscilloscope so that it is calibrated to 1 $\mu$sec/cm.

e. Adjust R44 until pulse duration is 5 $\mu$sec.

5-45. ADJUSTMENTS FOLLOWING KLYSTRON REPLACEMENT.

5-46. Following replacement of a new klystron (tube only) certain adjustments must be made before the instrument will operate in a satisfactory manner. The general steps in the overall procedure are as follows:

a. Establish initial reflector tracking voltages.

b. Partial reset of frequency dial.

c. Suppress undesired modes of oscillation, fine-adjust frequency dial and fine-adjust reflector tracking.

d. Output power response adjustment.

5-47. INITIAL REFLECTOR-VOLTAGE ADJUSTMENTS.

a. Check all power supply voltages as indicated in Table 5-2.

b. Reflector voltages can now be set, as described in paragraph 5-48, to values given on the data sheet

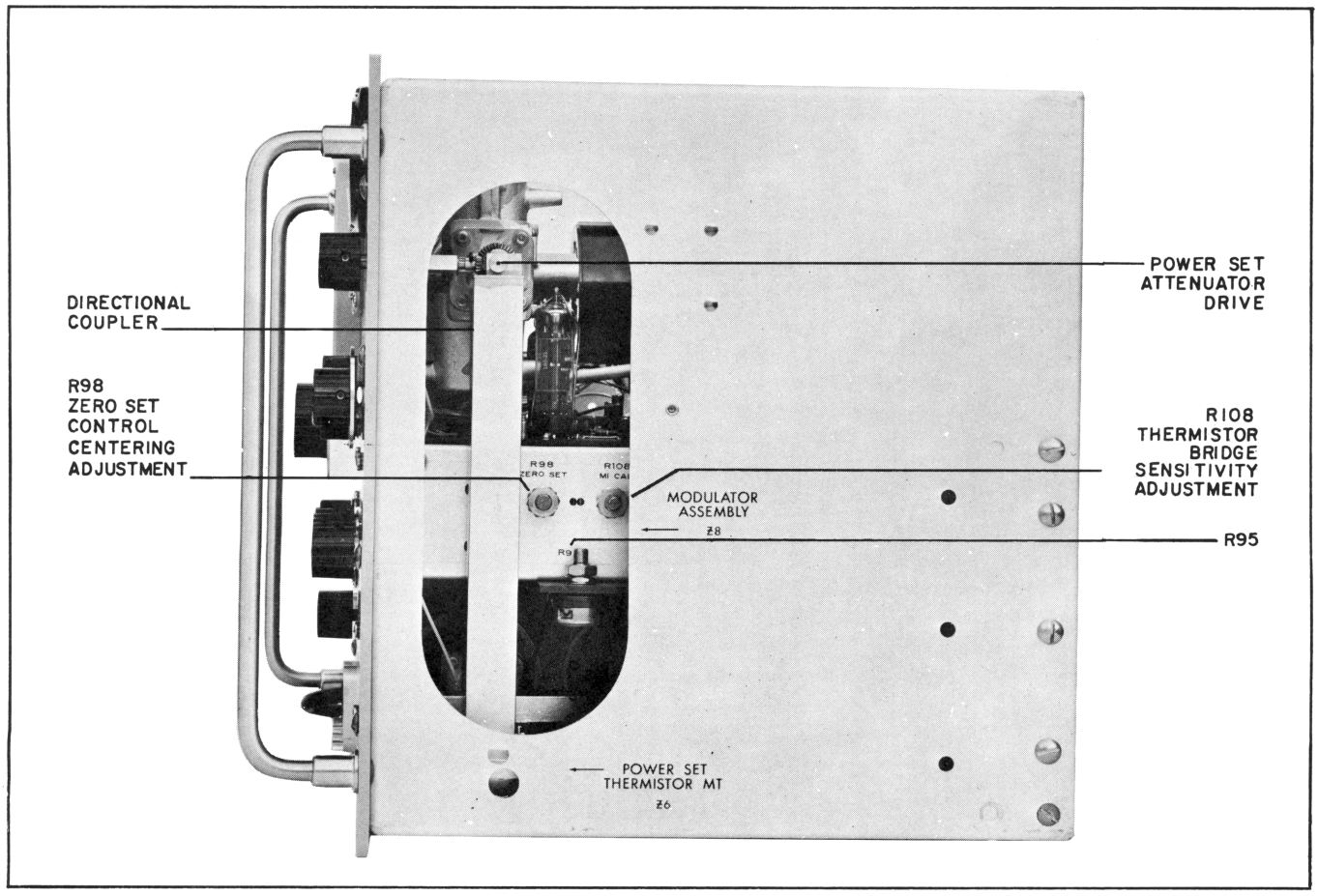



Figure 5-7. Right Side View Showing Power Monitoring Bridge Adjustments

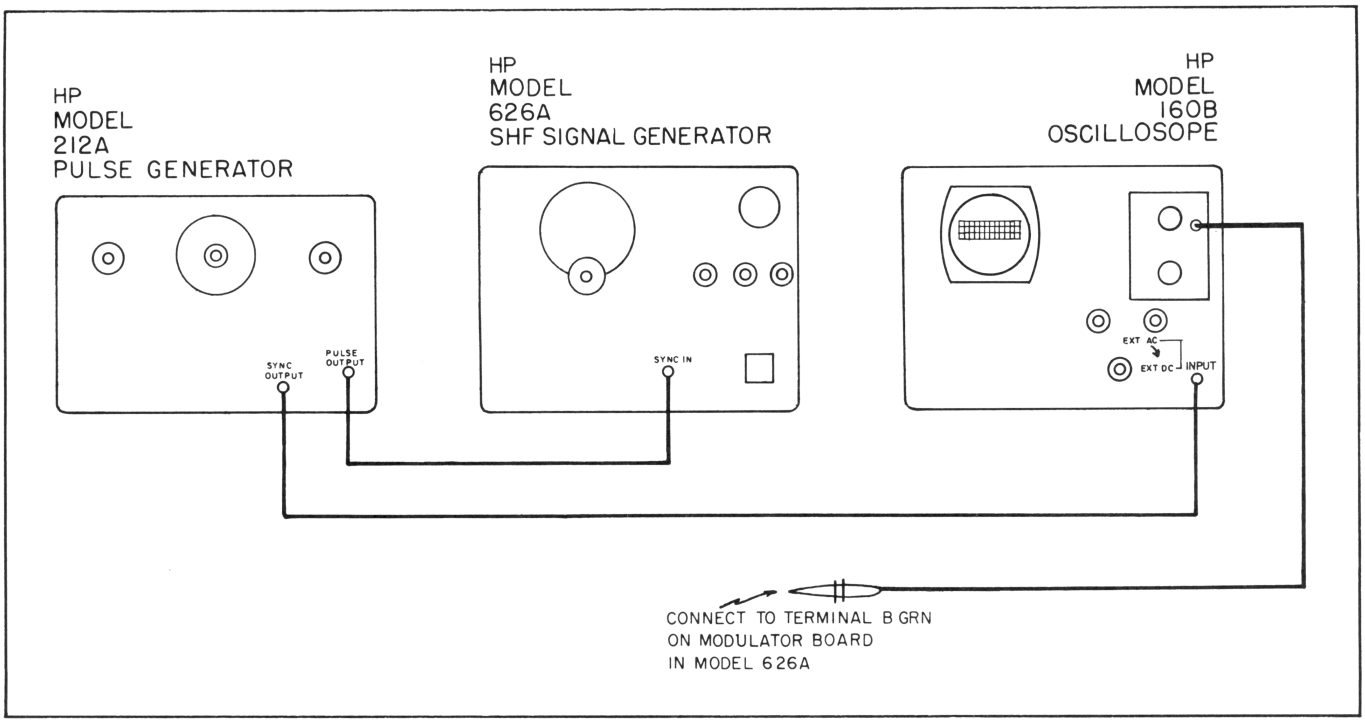



Figure 5-8. Test Setup for Schmitt Trigger Level Adjustment

supplied with the replacement klystron. Voltages are most easily measured at klystron terminal strip located on the modulator deck. There are four terminals marked K, H, H, R. Cathode-to-reflector voltage is measured between terminals K and R. The frequency at which each reflector tracking potentiometer is adjusted is shown in Figure 5-9.

Note

A data sheet supplied with the replacement klystron tabulates reflector (reflector-to-cathode) voltage vs frequency. The klystron manufacturer tests the tube under slightly different operating conditions from those in the instrument, but voltages are close enough to be useful when making tracking adjustments. It should be mentioned that while voltages given at 10 GHz and 15.5 GHz are directly applicable, the klystron manufacturer switches from 3-3/4 reflector mode to 4-3/4 reflector at a frequency (generally 13.5 GHz) which varies slightly from that at which the instrument switches (generally 12.8 GHz). Voltages specified in the data sheet should be used, however, and (R87 or R88) adjusted above and below the instrument mode switching point. (This is proper practice since adjustment pots are designed to adjust voltages at the high and low frequency sides of specific modes rather than at specific frequencies.) The setting obtained this way will be close enough for initial tracking.

WARNING

When measuring reflector-to-cathode voltage the reflector should be negative with respect to the cathode by the voltage shown in the data sheet. Use extreme care when measuring this voltage since it is 1200 volts negative with respect to instrument chassis.

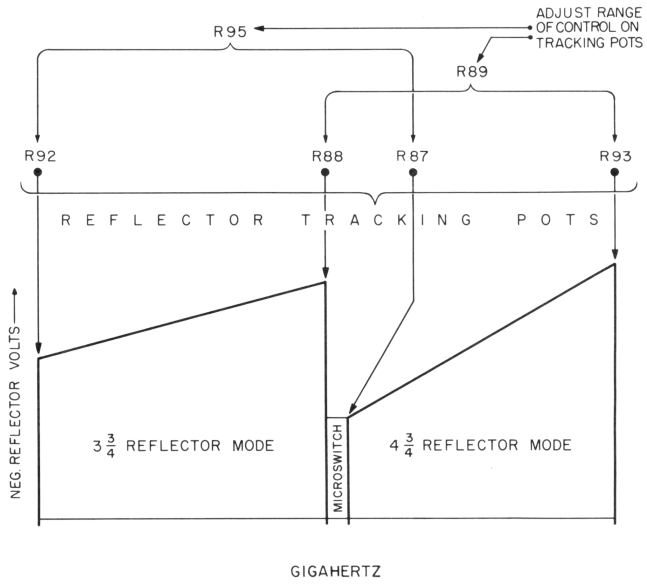



Figure 5-9. Graph Showing Reflector Tracking Voltage vs Frequency

5-48. INITIAL TRACKING PROCEDURE. Refer to Figure 5-10 and proceed as follows:

a. Set R95 and R89 to mechanical center of rotation.

b. Connect voltmeter common to klystron terminal K, and connect positive lead to klystron terminal R. Set frequency dial to 10 GHz and adjust R92 (and R95 if necessary) to read tabulated voltage for 10 GHz point.

c. Set frequency dial to point near 12.8 GHz just before microswitch actuates. Adjust R88 (and R89 if necessary) to read tabulated voltage for 3-3/4 reflector mode high frequency point.

d. Set frequency dial to point near 12.8 GHz just after microswitch actuates. Adjust R87 to read tabulated voltage for low frequency point of 4-3/4 reflector mode.

e. Set frequency dial to 15.5 GHz and adjust R93 to read tabulated voltage for 15.5-GHz point.

f. When voltages are correct, remove power from instrument and connect klystron heater and cathode leads as shown in Figure 5-4a.

5-49. INITIAL FREQUENCY SETTING.

a. Turn Model 626A on and check klystron heater voltage (paragraph 5-39).

b. Set Model 626A controls as follows:

MOD SELECTOR . . . . . INT FM
OUTPUT ATTEN . . . . . +10 DBM
FM AMPLITUDE . . . . . full clockwise
frequency dial . . . . . 15.5 GHz

c. Connect test setup as shown in Figure 5-11, and check for output.

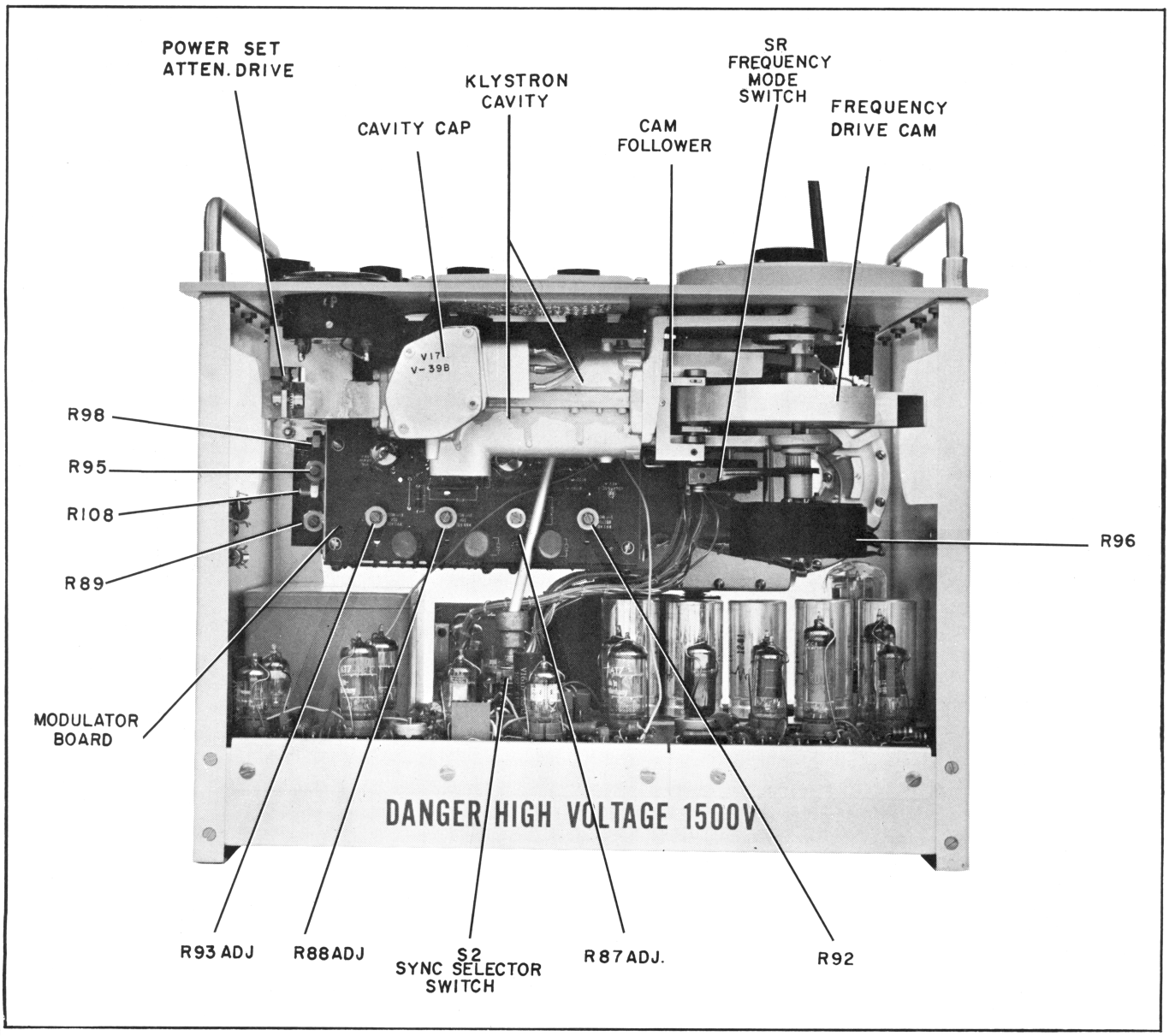



Figure 5-10. Top View Showing Location of Reflector Tracking Pots

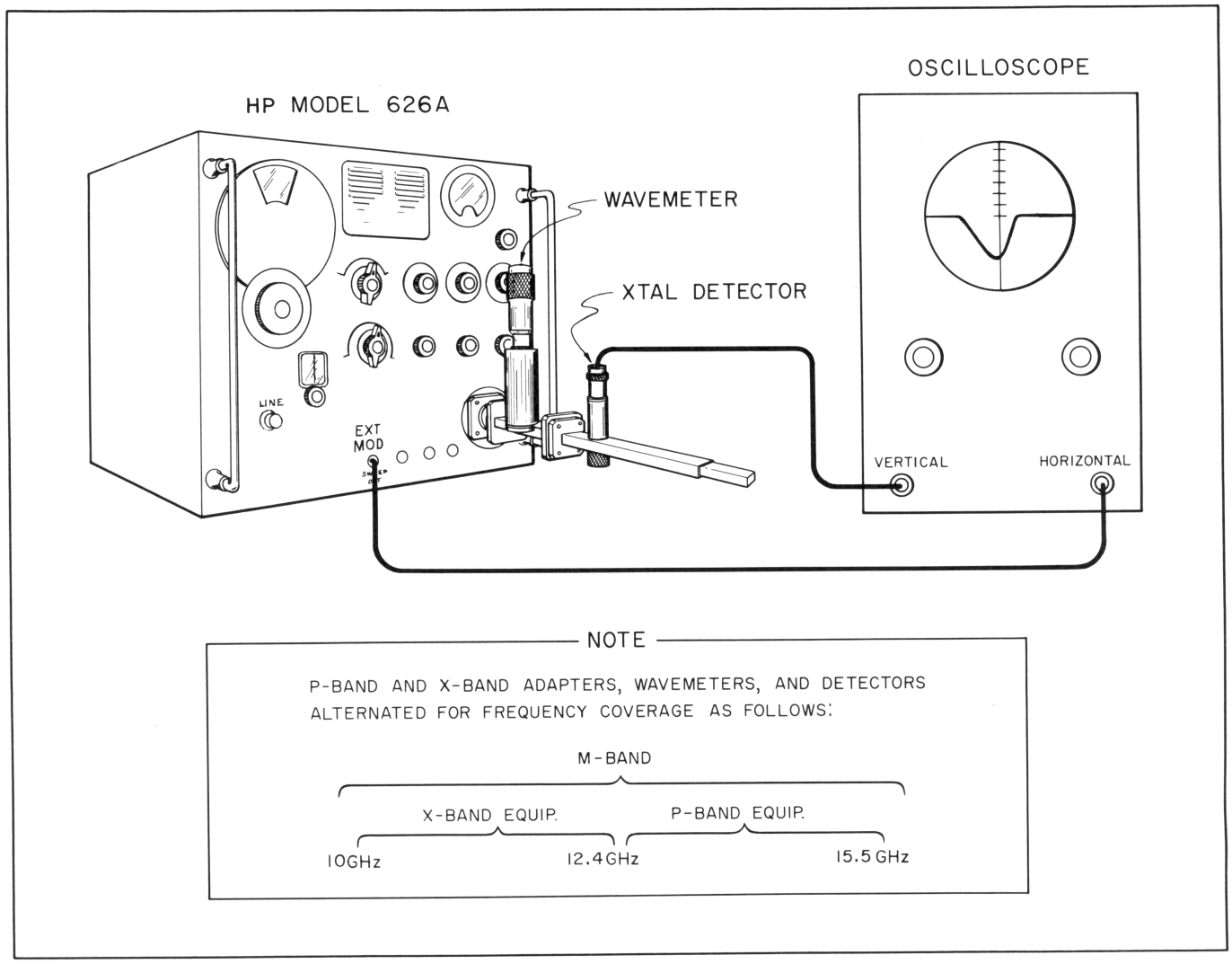



Figure 5-11. Test Setup for Observing Reflector Modes

Note

The test setup shown in figure 5-11 with control settings on the signal generator described in step b permits the Model 626A to internally FM the klystron with a 60-Hz sine wave of sufficient amplitude to drive the klystron in and out of oscillation (see paragraph 3-13). When an oscilloscope is connected, its horizontal sweep circuit is driven by 60 Hz synchronized with the 60-Hz sine wave frequency modulating the reflector. Vertical trace is driven by detected output from klystron. As klystron passes in and out of oscillation a humped waveform will appear on the oscilloscope. The hump is an indication of klystron output amplitude vs reflector voltage and may be construed as the reflector mode for frequency of oscillation. Typical mode pattern oscillograms appear in Figure 5-12.

d. Adjust oscilloscope to center horizontal trace for equal deflection on each side of vertical scale center.

e. Adjust FM PHASE for optimum presentation of mode pattern at 15.5 GHz. It may be necessary to bring crest of the mode pattern closer to the oscilloscope vertical center line with R93 in order to produce satisfactory output, but such a tracking adjustment is not critical at this stage of alignment as long as significant output is available at extremes of the band. If voltages have been set according to klystron manufacturer's data sheet, adequate output should be available, barring such considerations as a weak klystron or improper seating in cavity.

f. Set frequency dial near high frequency end. Where plunger rod is accessible, loosen setscrews holding plunger rod to cam follower (refer to Figure 5-5).

WARNING

When loosening setscrews holding plunger rod to cam follower, extreme care should be used as microswitch (located near cam follower) has high negative voltages on it.

g. Pull plunger rod out of cavity until it hits frequency drive cam. Tighten lightly side setscrew holding plunger rod to cam follower.

h. Set frequency dial to 15.5 GHz (changing wavemeters and detector mounts if necessary) and set wavemeter to 15.5 GHz. Loosen setscrew holding plunger rod.

i. With a thin-pointed tool, push plunger rod slightly into the cavity until wavemeter notch appears on mode pattern. Tighten one setscrew lightly which holds plunger rod to cam follower.

Note

The purpose of adjustments in step i (adjusting plunger rod) and in step m (adjusting cam) is to adjust the length of plunger travel against length of dial travel from the low end of the band to high end of the band. These adjustments interact, but by repeated adjustments of the cam at 10 GHz and plunger rod at 15.5 GHz, the ends of the dial may be brought into calibration. DO NOT loosen frequency dial hub-screws or otherwise attempt to calibrate the dial by slipping it at the hub.

j. Repeat steps e through h to obtain approximate dial calibration at the end of the band. Final calibration is made between mode suppression and fine tracking adjustments.

k. Set 10 GHz on wavemeter and also on Model 626A frequency dial. If wavemeter notch is present on mode pattern, proceed with paragraph 5-50. If notch is not present, proceed with step m.

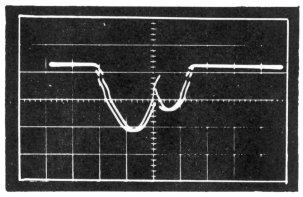
m. Loosen setscrews on frequency drive cam. Hold frequency dial in position and adjust the cam (thus moving cam follower, plunger rod, and plunger) until wavemeter notch appears on mode pattern. Tighten setscrews on frequency drive cam.

5-50. MODE SUPPRESSION AND REFLECTOR TRACKING. Mode suppression in Model 626A consists of reducing effects of the 1/4 wave cavity mode and, in case of vigorous tubes, the 5/4 wave cavity mode. These unwanted modes create most problems around the 12.8 GHz mode switch point and it is here that suppression is conducted.

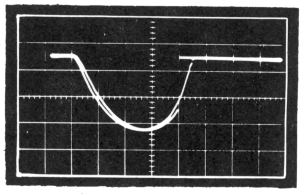
5-51. Unwanted modes are suppressed before fine reflector tracking adjustments are made, and in rare cases the fine tracking adjustments may interact with the 1/4 wave cavity mode suppression. When this happens the 1/4 wave mode suppressor can be adjusted slightly to restore adequate suppression. Trouble with the 5/4 wave cavity mode is remote; however, proper techniques for suppressing both unwanted modes are described.

a. Connect test setup as shown in Figure 5-11.

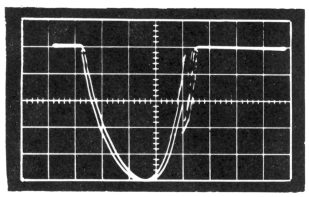
b. Set frequency to the high frequency side of mode switching point and look for evidence of the 1/4 wave cavity mode. At this point on the frequency dial the 1/4 wave mode will appear on the high frequency (high



a. 4-3/4 λ reflector mode (3/4 λ cavity mode) at high frequency side of mode switch (just above 12.8 GHz). Undesired 1/4 λ cavity mode at right inadequately suppressed.



b. Same as (a) except that 1/4 λ cavity mode adequately suppressed, and 4-3/4 λ reflector mode (3/4 λ cavity mode) is centered properly. 3-3/4 λ reflector mode should have the same appearance as this when unwanted modes are properly suppressed.



c. 3-3/4 λ reflector mode (3/4 λ cavity mode) at 10.8 GHz. Undesired 5/4 λ cavity mode, shown as slight bulge at left, inadequately suppressed.

Figure 5-12. Typical Mode Patterns

voltage) side of the desired mode. Under worst conditions two similar modes can be present. Modes can be identified with a wavemeter if doubt exists as to which side of the modes is the high frequency (high voltage) side.

Note

Desired and undesired modes are most easily identified by using a wavemeter. Frequency of the 1/4 wave cavity mode will be from 9.7 to 10.7 GHz while that of the desired mode will correspond closely to that shown on the frequency dial, approximately 12 to 13 GHz. Frequency of the 5/4 wave cavity mode will probably be above 15.5 GHz.

c. Adjust the 1/4 wave mode suppressor matching screw to eliminate interference. Use the special fiber tool supplied with the instrument and refer to Figure 5-13.

WARNING

To reach the 1/4 wave suppressor matching screw the tool must pass between klystron heater and cathode connections. USE CARE due to high negative voltages at these points. The best way to use the special tool is to insert the fiber tube (suppressor locknut wrench) first; then insert the metal suppressor wrench through the fiber tube to adjust the suppressor. Lock down the suppressor matching screw when adjustment is completed. Remove metal wrench, then remove fiber wrench.

d. Tune up the band to 15.5 GHz observing oscilloscope pattern as you go. At higher frequencies the 1/4 wave mode may reappear, but it will be on the low frequency side of the desired mode at these frequencies and will cause no interference. If actual interference

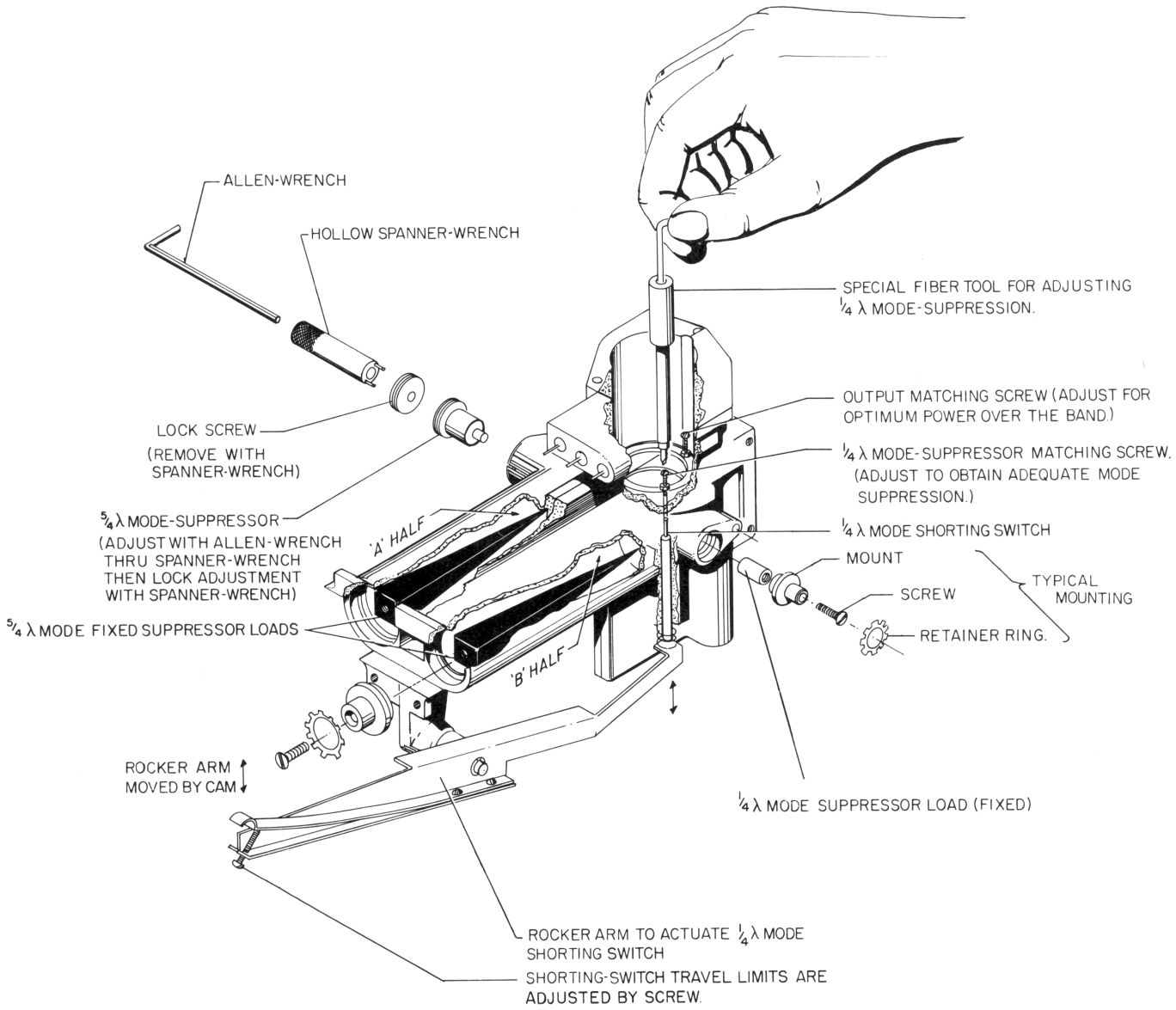



Figure 5-13. Adjustment of Mode Suppressors and Output Matching Screw

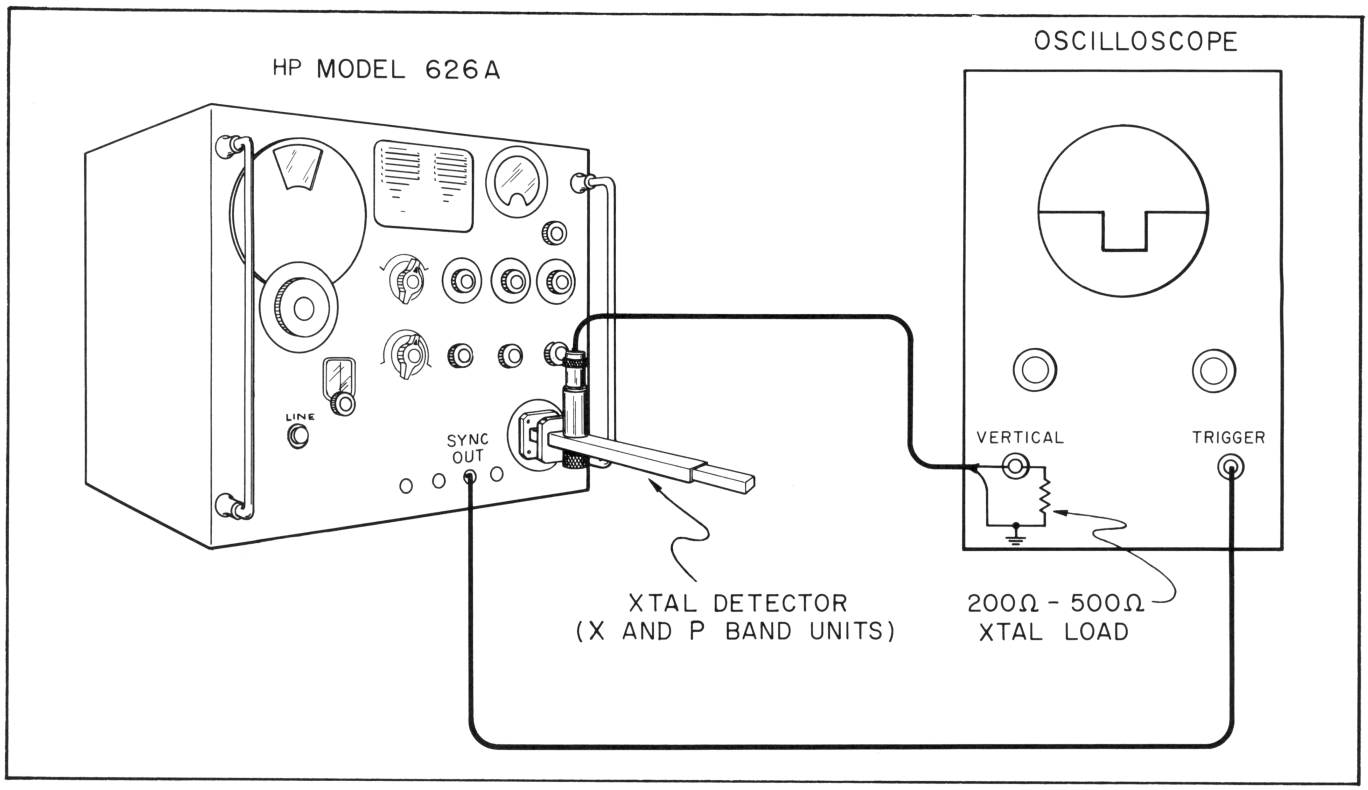



Figure 5-14. Calibration Test Setup

occurs between 12.8 and 15.5 GHz, readjust 1/4 wave mode suppressor matching screw.

e. Tune the frequency dial across the low end of the band from stop to mode switch point. The 5/4 wave mode, if present, will normally appear somewhere below 10.2 GHz. Its presence is revealed as a slight outward bulge on the high frequency side of the desired mode at the base line as shown in Figure 5-12c.

f. To suppress this mode, adjust the 5/4 wave mode suppressor shown in Figure 5-13. Another special tool is provided to assist you in this adjustment; it is the small hollow spanner wrench secured inside the chassis. After unthreading lock screw insert a No. 10 allen wrench through it to adjust suppressor. After achieving the desired suppression, lock suppressor in place.

g. Check across entire frequency band to make sure that all mode suppression is effective.

h. Perform paragraph 5-49, steps f through m, except dial should be set to within 100 MHz of 10 GHz and within 155 MHz of 15.5 GHz. Check points between 10 15.5 GHz. If these points are out of specifications (1%) a compromise of the extremes will correct the dial.

i. After final dial calibration tighten all setscrews.

j. Once undesired modes have been suppressed and final dial calibration performed, the reflector tracking must be fine-adjusted. Center the oscilloscope horizontal trace.

k. Set frequency dial to 10 GHz and adjust R92 so that the vertical centerline of oscilloscope graticule divides the mode pattern about 1/3 of the way from the high frequency side into the mode. Verify high frequency side, if necessary, with wavemeter.

Note

When MOD SELECTOR is placed in OFF position, voltage applied to reflector should bias the klystron off. If mode pattern is centered on oscilloscope the reflector voltage may not be adequate to bias the klystron off. Pulse and square-wave operation may be deteriorated by failure of klystron to cut off during "off" portion of modulation. If mode pattern is positioned so that the high frequency side is too close to oscilloscope vertical centerline, a weak output is obtained.

m. Set frequency dial to point just before microswitch actuation and adjust mode pattern with R87 as described in step k.

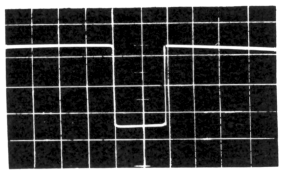
n. Set frequency dial to point just past microswitch actuation and adjust mode pattern with R87 as described in step k.

p. Set frequency dial to 15.5 GHz and adjust mode tern with R93 as described in step k.

q. Since adjustments are somewhat interacting, tune through frequency range of Model 626A observing tracking behavior. Readjust pots as necessary to produce satisfactory tracking.

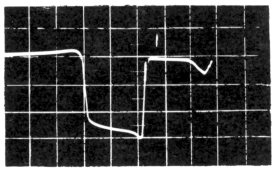
5-52. TRACKING CHECK, PULSE AND SQUARE WAVE.

a. Connect test setup as shown in Figure 5-14.



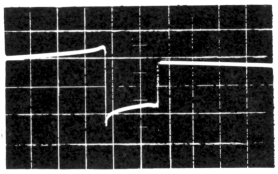
Correct tracking adjustments. Ideal RF pulse. Note absence of overshoot, good rise and decay, flat crest and base lines.

a.



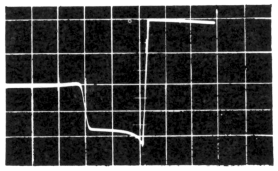
Tracking voltage nearly correct but small pulse to left indicates oscillation taking place during pulse "off" time.

c.



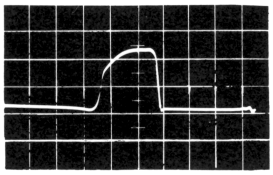
Incorrect tracking voltage. Reflector voltage pulses beyond mode crest. Pulse crest should be from 90%-100% of initial rise amplitude and overshoot no more than 10% of initial rise.

b.



High base line at right indicates that tracking adjustment prevents klystron from biasing "off" during pulse off time.

d.



Reflector tracking voltage incorrect. Instrument pulsing "off" when actually "on" and vice-versa.

e

Figure 5-15. Typical Pulse and Square Wave Oscillograms

b. Set Model 626A controls as follows:

| | |
|---|---|
| SYNC SELECTOR | X10 |
| MOD SELECTOR | INT |
| PULSE RATE | 100 |
| PULSE DELAY | 3 μsec |
| PULSE WIDTH | 1 μsec |

c. Adjust oscilloscope for a 1 μsec/cm sweep.

d. Tune frequency dial on signal generator slowly from 10 to 15.5 GHz while observing pulse shape and pulse base line appearance on oscilloscope. Various pulse waveforms are shown in Figure 5-15. If pulses have sharp overshoot, the reflector tracking potentiometer for that frequency has been adjusted beyond the crest of the mode pattern. A ragged base line indicates that oscillation is taking place when klystron should be cut off. If either of these troubles are present, readjust tracking potentiometer applicable to reflector mode and frequency under examination.

e. Set MOD SELECTOR to OFF and PWR SET to full clockwise position. Tune across the band while observing power-monitor meter for any indication of RF power. Where power is present the reflector tracking voltage for the particular frequency is not properly adjusted and does not bias klystron out of oscillation mode. Adjust appropriate tracking potentiometer to eliminate indication.

5-53. OUTPUT POWER RESPONSE ADJUSTMENT. After satisfactory tracking has been obtained and undesired modes suppressed, the output matching screw must be adjusted as shown in Figure 5-13.

a. Connect test setup as shown in Figure 5-16.

b. Set signal generator frequency dial to 10 GHz and PWR SET for maximum output power as indicated on Model 430C. Record reading obtained.

c. Set signal generator frequency dial to 15.5 GHz and record reading obtained.

d. Adjust output matching screw for a reading approximately midway between readings obtained in steps b and c. This adjustment is interacting so repeat it at 10 and 15.5 GHz until maximum output power is approximately equal at both ends of frequency band.

e. Check across frequency band to see that power-monitor meter can be POWER SET.

## 5-54. CALIBRATION.

5-55. CALIBRATING PULSE RATE DIAL.

5-56. Replacing V9 may change calibration of the pulse rate dial but will not otherwise affect the signal generator performance. If the replacement tube triode sections are too far out of balance, try another tube. Recalibration procedure is as follows:

a. Connect test setup as shown in Figure 5-14. DELAYED SYNC OUT signal may be used instead of the RF pulse.

b. In series with the output of a calibrated audio oscillator, connect a 10K resistor and then connect the oscillator to the vertical input of oscilloscope.

c. Zero-set and power-set the power-monitor meter. Refer to paragraphs 3-9b and 3-9c.

d. Set Model 626A controls as follows:

| | |
|---|---|
| MOD SELECTOR | INT |
| SYNC SELECTOR | X10 |
| PULSE RATE | 100 |

e. Set audio oscillator frequency to 1000 Hz.

f. Adjust PULSE RATE until sync pulses zero-beat with signal from audio oscillator.

g. Without changing PULSE RATE control position, slip dial so that 100 is located under index on front panel.

h. Check PULSE RATE dial calibration at 40 and 400. If dial is in error, slip dial to average error across range.

5-57. CALIBRATING PULSE DELAY DIAL.

a. Connect test setup as shown in Figure 5-14.

b. Zero-set and power-set the power-monitor meter. Refer to paragraphs 3-9b and 3-9c.

c. Set Model 626A controls as follows:

| | |
|---|---|
| MOD SELECTOR | INT |
| SYNC SELECTOR | X1 or X10 |
| PULSE DELAY | minimum |

d. Adjust R78 (Figure 5-2) so that delay between SYNC OUT (start of horizontal trace) and leading edge of RF pulse is < 5 microseconds on calibrated oscilloscope.

e. Set PULSE DELAY so that 50 microseconds delay exists between SYNC OUT and leading edge of RF pulse.

f. Without changing PULSE RATE control position, slip dial so that 50 is located under index on front panel.

g. Check PULSE DELAY dial calibration at 5 and 200. If necessary repeat steps c through f.

5-58. CALIBRATING PULSE WIDTH DIAL.

a. Connect test setup as shown in Figure 5-14 except that DELAYED SYNC OUT signal is to be used for triggering oscilloscope.

b. Zero-set and power-set the power-monitor meter. Refer to paragraphs 3-9b and 3-9c.

c. Set Model 626A MOD SELECTOR to INT and PULSE WIDTH to minimum.

d. Adjust R85 (Figure 5-2) for a pulse width of just less than 0.5 microseconds as observed on a calibrated oscilloscope.

e. Locate within frequency band of generator the point of maximum pulse width.

f. At frequency of maximum pulse width, readjust R85 for a pulse width of just less than 0.5 microseconds.

g. Set PULSE WIDTH for a 10-microsecond pulse as observed on calibrated oscilloscope.

h. Without changing PULSE WIDTH control position, slip dial so that 10 is located under index on front panel.

5-59. POWER-MONITOR METER CALIBRATION.

5-60. Replacement of power-set monitoring thermistor (RT123) requires considerable skill and equipment. If facilities are not available consult your Hewlett-Packard field sales engineer or write Customer Service Department at the factory concerning repair.

5-61. If facilities are available, and the replacement is to be made in the field, the entire thermistor mount may be procured as a unit under HP Stock No. 626A-28.

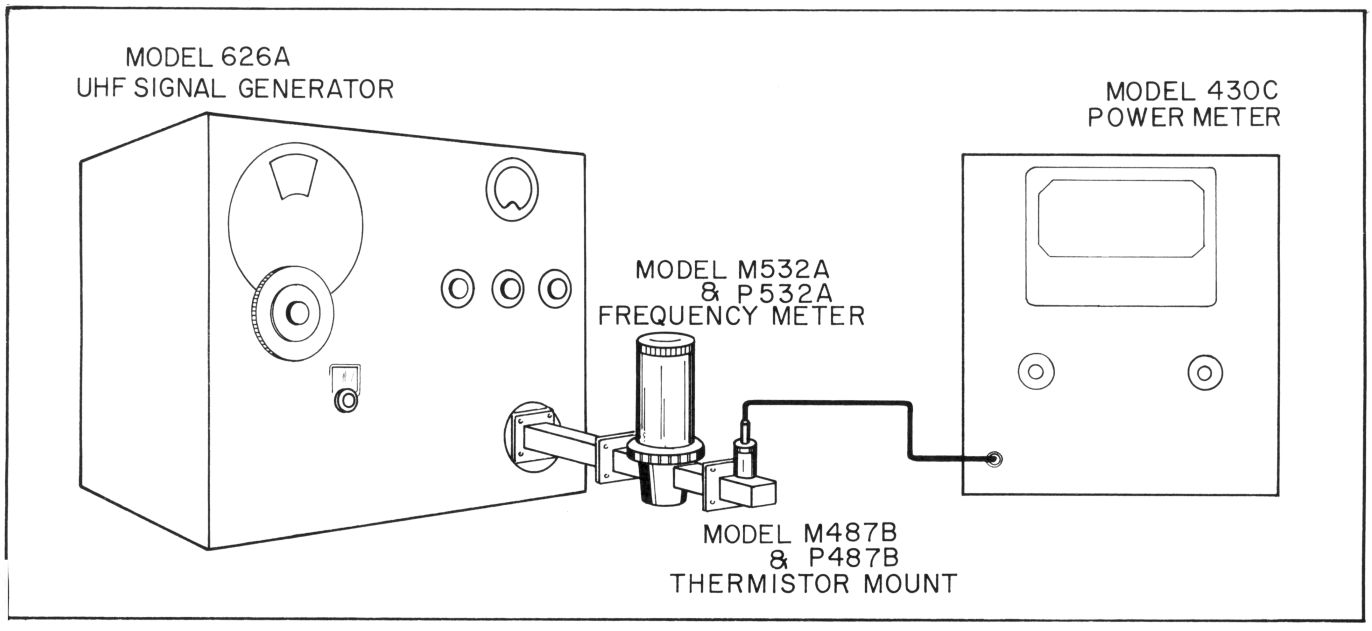



Figure 5-16. Test Setup for Adjusting Output Power

Recalibration procedure for the power-monitor meter is as follows:

a. Connect test setup as shown in Figure 5-16.

b. Set Model 626A MOD SELECTOR to CW and frequency dial to center of band (12.75 GHz).

c. Set OUTPUT ATTEN to -2 dBm and adjust PWR SET for a -2 dBm reading on Model 430C.

d. Adjust R108 (Figure 5-7) so that power-monitor meter indicates 0 dBm (red line at center of scale).

Note

To increase accuracy of power output calibration at a particular frequency follow the above procedure at that frequency.

## 5-62. PERFORMANCE CHECKS.

5-63. Performance checks are included to verify proper operation of the Model 626A. They may be used by incoming quality control for the electrical inspection.

5-64. FREQUENCY CALIBRATION CHECK.

a. Connect test setup as shown in Figure 5-16 using M-band equipment.

b. Set signal generator frequency dial to 10 GHz.

c. Zero-set and power-set the power-monitor meter. Refer to paragraphs 3-9b and 3-9c.

d. Set MOD SELECTOR to CW and OUTPUT ATTEN to 0 dBm.

e. Adjust power meter to read 0 dBm (1 mW).

f. Adjust frequency meter to locate a dip in power around the frequency output of signal generator. Frequency meter should read 10 GHz ±100 MHz.

g. Set signal generator frequency dial to 12.5 GHz, and repeat steps c through f. Frequency meter should read 12.5 GHz ±125 MHz.

h. Remove M-band equipment from test setup, and replace with P-band equipment using the Model MP292B Adapter. Adapter is to be connected between frequency meter and RF OUTPUT of signal generator.

i. Set signal generator frequency dial to 15.5 GHz, and repeat steps c through f. Frequency meter should read 15.5 GHz ±155 MHz.

5-65. OUTPUT POWER CHECK.

a. Connect test setup as shown in Figure 5-16 using P-band equipment and the Model MP292B Adapter.

b. Using a calibrated frequency meter, set signal generator output for 15.5 GHz.

c. Zero-set and power-set the power-monitor meter. Refer to paragraphs 3-9b and 3-9c.

d. Set MOD SELECTOR to OFF and OUTPUT ATTEN to -1 dBm.

e. Zero-set a power meter such as a Model 430C as per its instruction manual, and set RANGE switch to 0 dBm.

f. Set signal generator MOD SELECTOR to CW.

g. With Model 430C properly zero-set, the meter should read -1 dBm ±1 dB.

h. Repeat steps b through g except set signal generator output for 12.5 GHz.

i. Remove P-band equipment and adapter from test setup and replace with M-band equipment.

j. Repeat steps b through g except set signal generator output for 10 GHz.

NOTES: ALL VOLTAGES MEASURED FROM INDICATED POINT TO CHASSIS GROUND UNLESS OTHERWISE NOTED.
✪ VOLTAGES MEASURED FROM INDICATED POINT TO -300V BUS.

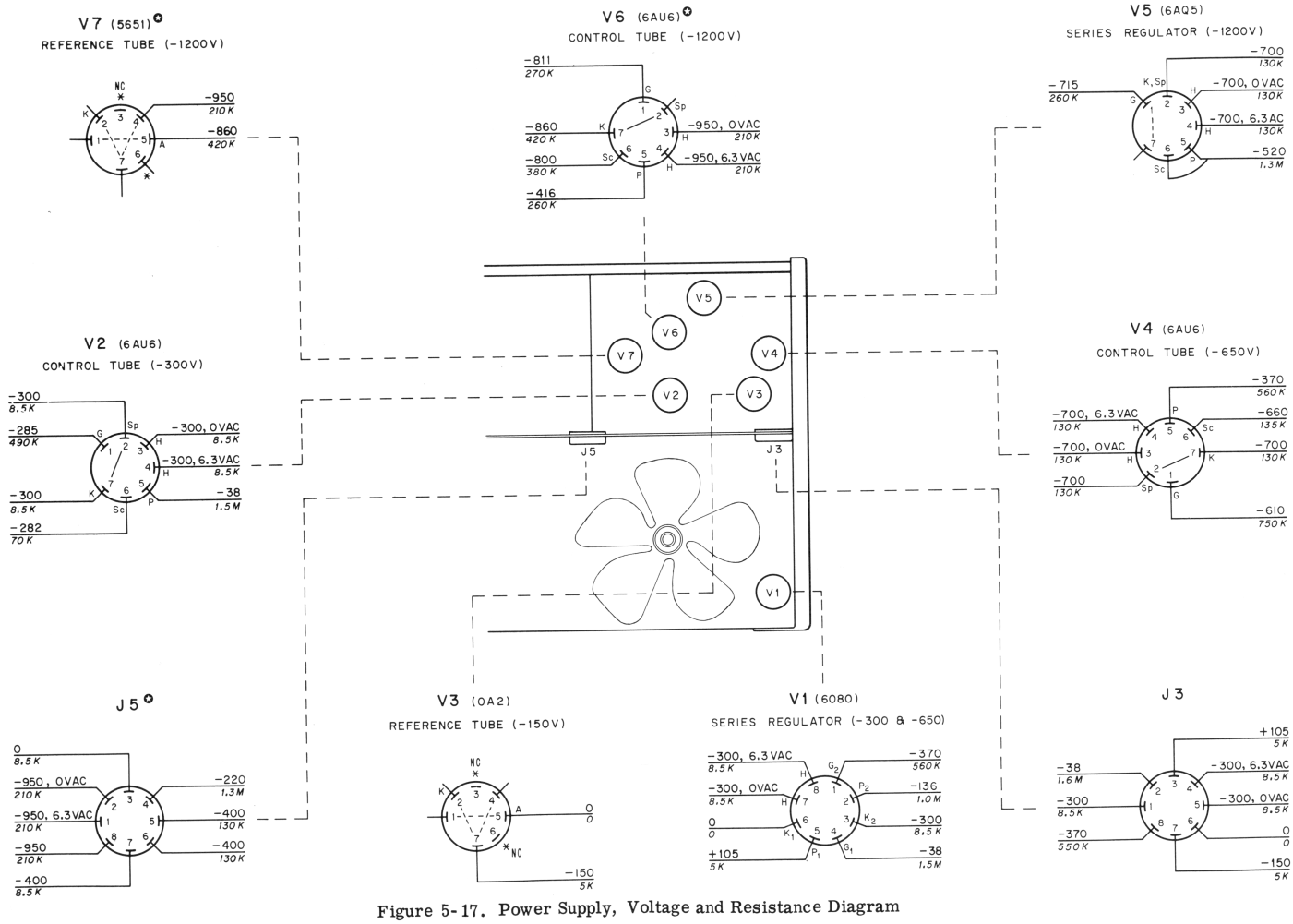
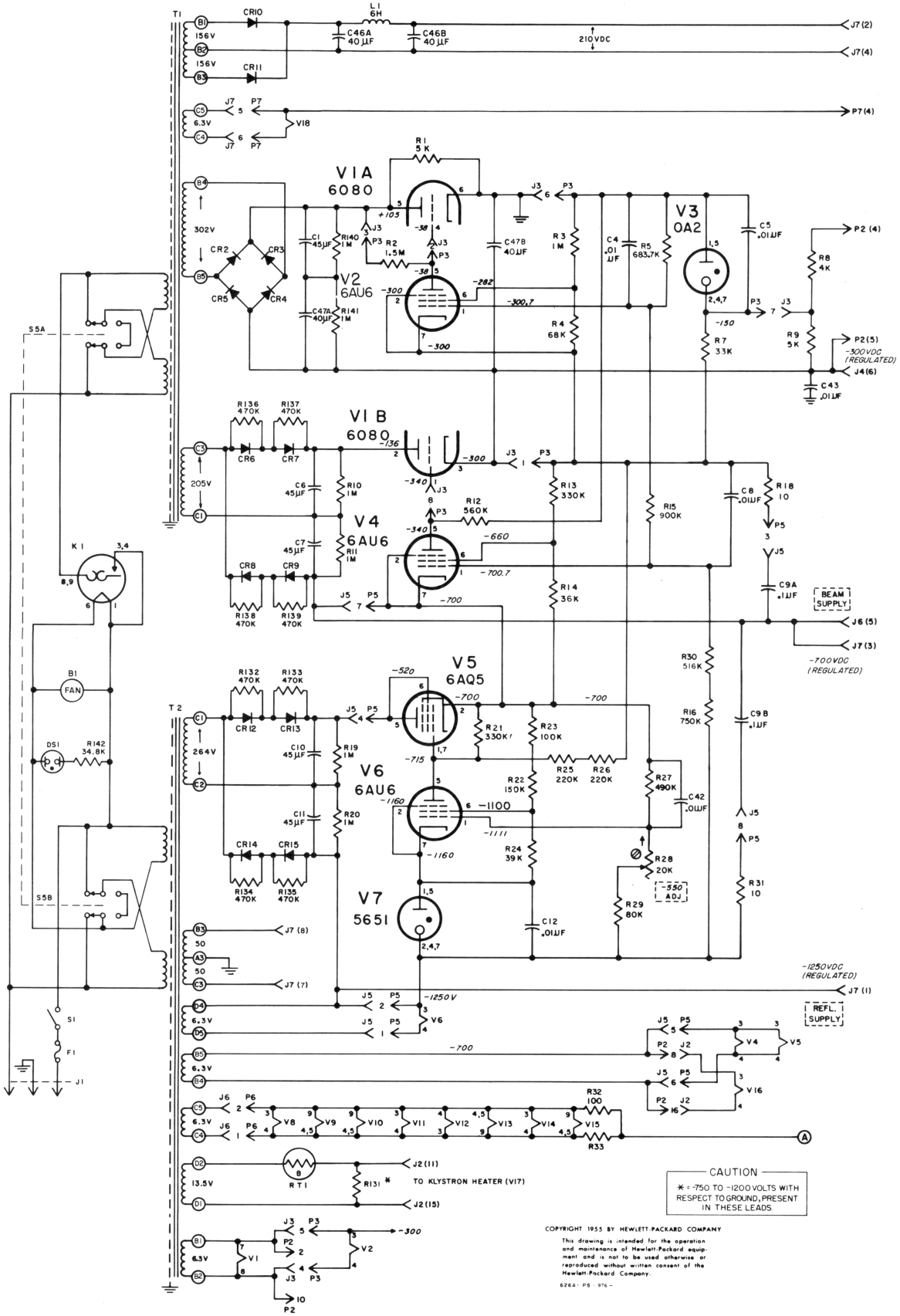



Figure 5-17. Power Supply, Voltage and Resistance Diagram

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626A-PS-976-

Figure 5-18. Power Supply

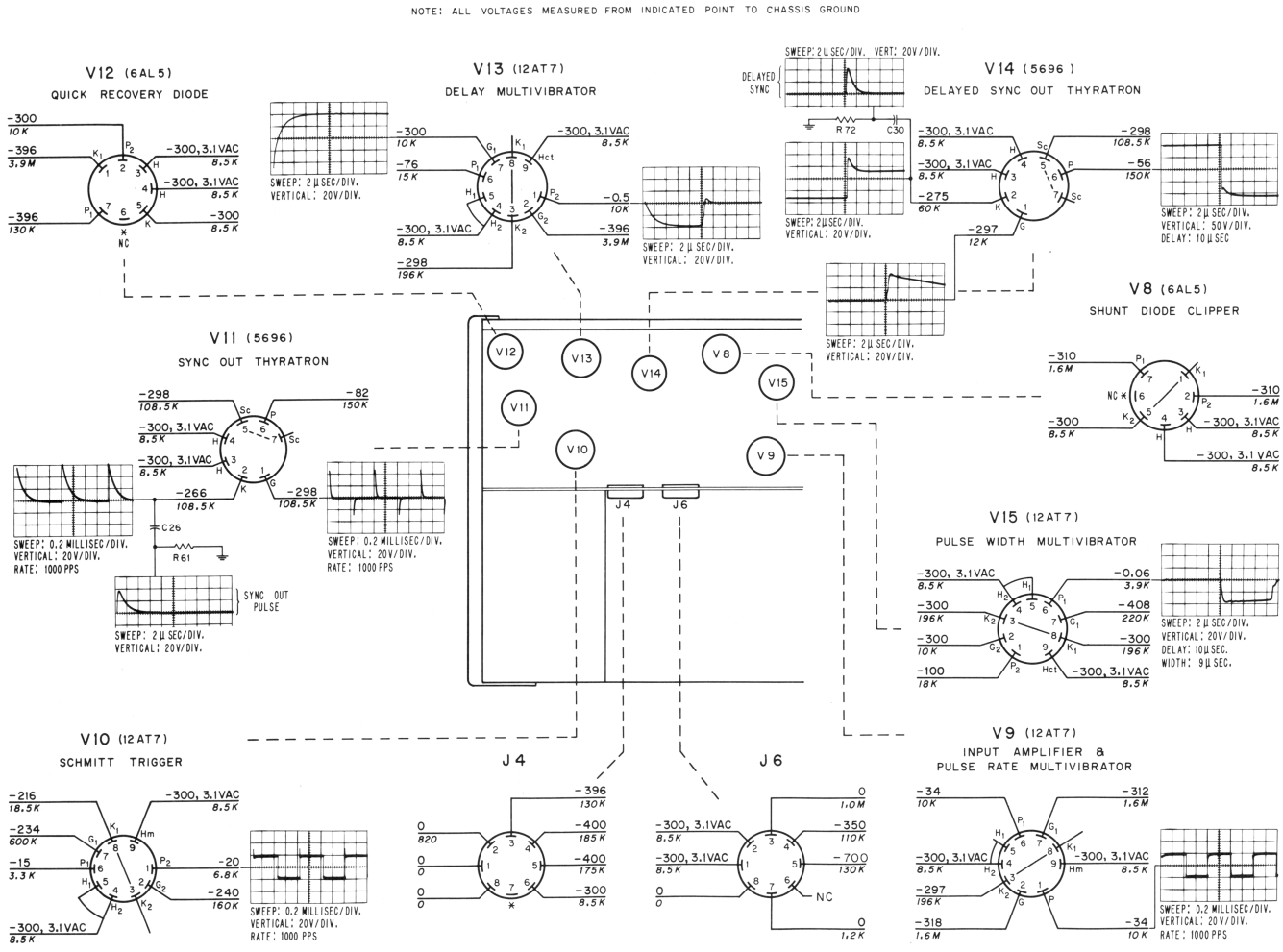


Figure 5-19. Pulse Section, Voltage and Resistance Diagram

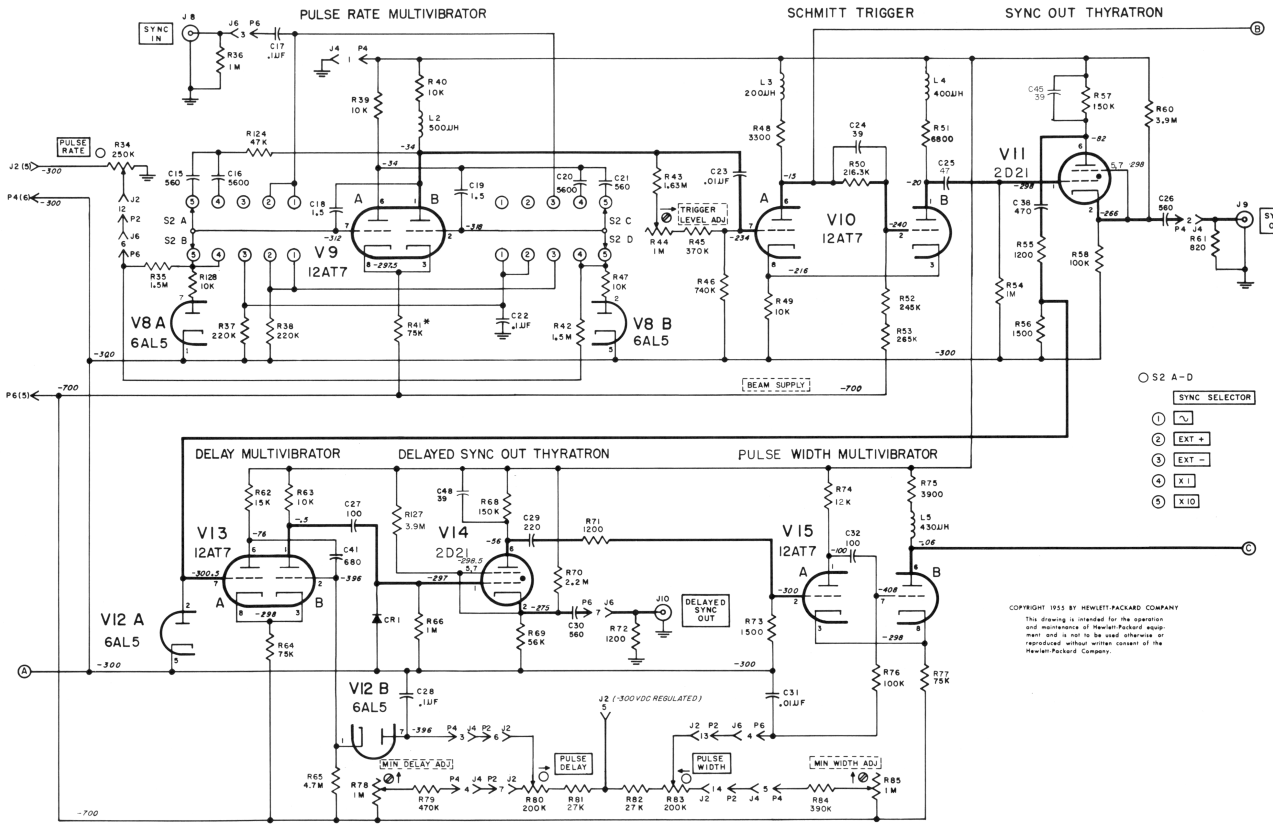


Figure 5-20. Pulse Generator

NOTE: WHEN TWO VOLTAGES ARE SHOWN THE FIRST IS DC; THE SECOND IS AC.
ALL VOLTAGES AND RESISTANCES ARE MEASURED WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED.

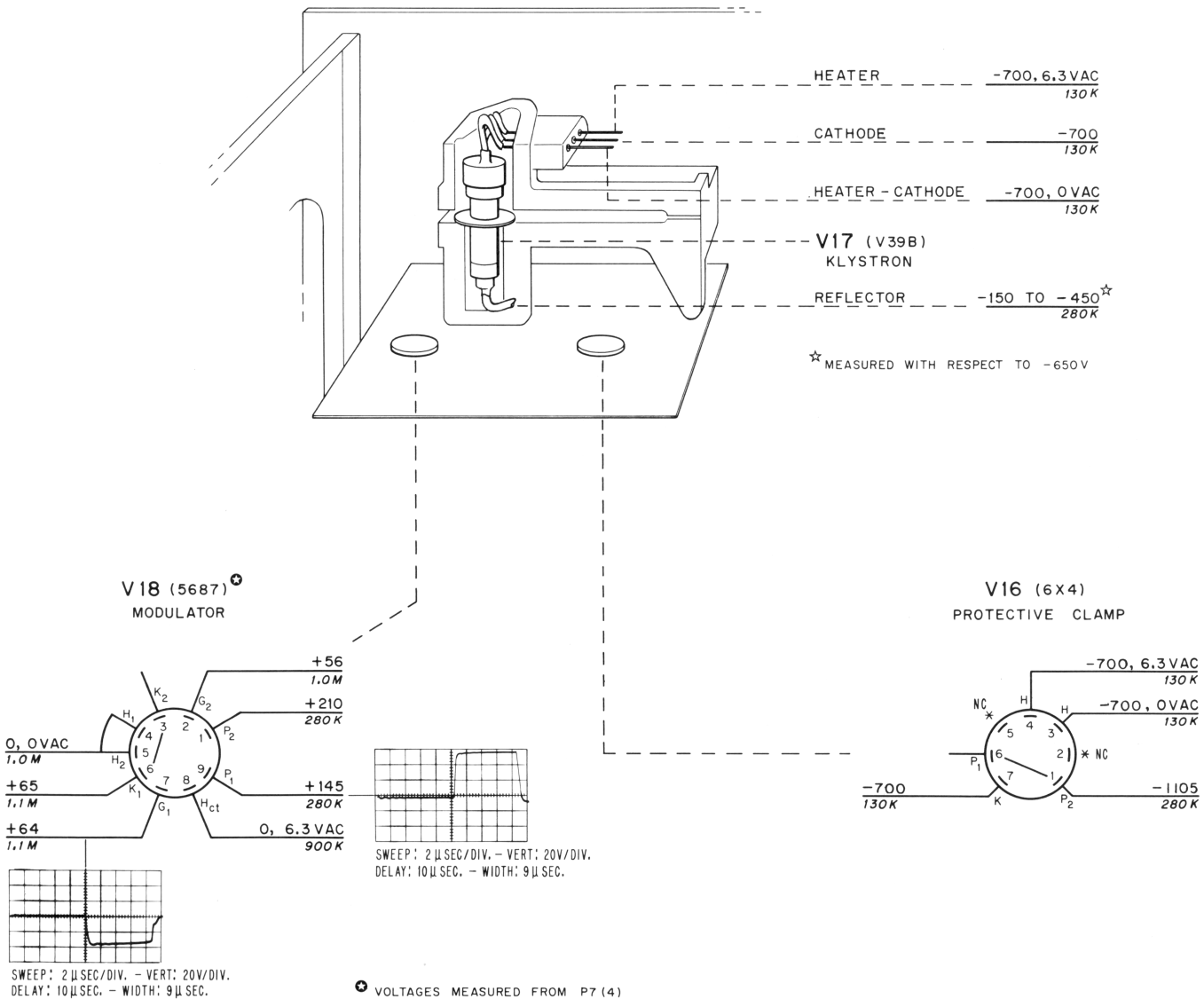


**Figure 5-21. Modulator and RF Generator Sections, Voltage and Resistance Diagram**

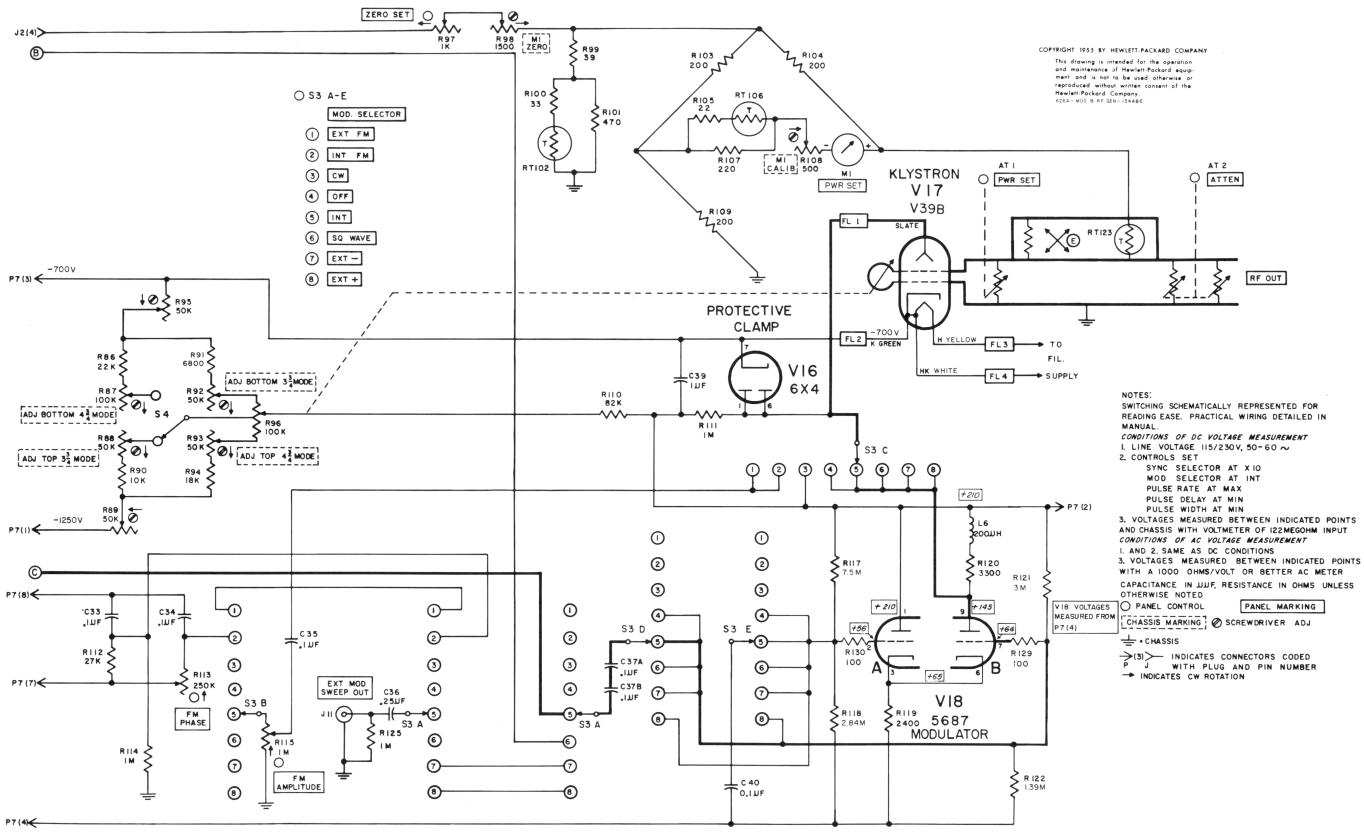


Figure 5-22. Modulator and RF Generator

# SECTION VI
# REPLACEABLE PARTS

## 6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. Table 6-1 lists parts in alpha-numerical order of their reference designators and indicates the description and stock number of each part, together with any applicable notes. Table 6-2 lists parts in alpha-numerical order of their stock numbers and provides the following information on each part:

a. Description of the part (see list of abbreviations below).

b. Typical manufacturer of the part in a five-digit code; see list of manufacturers in appendix.

c. Manufacturer's stock number.

d. Total quantity used in the instrument (TQ col.).

e. Recommended spare part quantity for complete maintenance during one year of isolated service (RS column).

6-3. Miscellaneous parts not indexed in table 6-1 are listed at the end of Table 6-2.

## 6-4. ORDERING INFORMATION.

6-5. To order a replacement part, address order or inquiry either to your authorized Hewlett-Packard sales representative or to

CUSTOMER SERVICE
Hewlett-Packard Company
333 Logue Avenue
Mountain View, California

or, in Western Europe, to

Hewlett-Packard S. A.
1217 Meyrin
Geneva, Switzerland

6-6. Specify the following information for each part:

a. Model and complete serial number of instrument.

b. Hewlett-Packard stock number.

c. Circuit reference designator.

d. Description.

6-7. To order a part not listed in Tables 6-1 and 6-2, give a complete description of the part and include its function and location.

REFERENCE DESIGNATORS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | = assembly | F | = fuse | P | = plug | V | = vacuum tube, neon bulb, photocell, etc. |
| B | = motor | FL | = filter | Q | = transistor | W | = cable |
| C | = capacitor | J | = jack | R | = resistor | X | = socket |
| CR | = diode | K | = relay | RT | = thermistor | XF | = fuseholder |
| DL | = delay line | L | = inductor | S | = switch | XDS | = lampholder |
| DS | = device signaling (lamp) | M | = meter | T | = transformer | Z | = network |
| E | = misc electronic part | MP | = mechanical part | | | | |

ABBREVIATIONS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| a | = amperes | elect | = electrolytic | mtg | = mounting | rot | = rotary |
| bp | = bandpass | encap | = encapsulated | my | = mylar | rms | = root-mean-square |
| bwo | = backward wave oscillator | f | = farads | NC | = normally closed | rmo | = rack mount only |
| c | = carbon | fxd | = fixed | Ne | = neon | s-b | = slow-blow |
| cer | = ceramic | Ge | = germanium | NO | = normally open | Se | = selenium |
| cmo | = cabinet mount only | grd | = ground (ed) | NPO | = negative positive zero (zero temperature coefficient) | sect | = section(s) |
| coef | = coefficient | h | = henries | nsr | = not separately replaceable | Si | = silicon |
| com | = common | Hg | = mercury | obd | = order by description | sil | = silver |
| comp | = composition | impg | = impregnated | p | = peak | sl | = slide |
| conn | = connection | incd | = incandescent | pc | = printed circuit board | td | = time delay |
| crt | = cathode-ray tube | ins | = insulation (ed) | pf | = picofarads = $10^{-12}$ farads | $TiO_2$ | = titanium dioxide |
| dep | = deposited | K | = kilo = 1000 | pp | = peak-to-peak | tog | = toggle |
| EIA | = Tubes or transistors meeting Electronic Industries' Association standards will normally result in instrument operating within specifications; tubes and transistors selected for best performance will be supplied if ordered by **HP stock numbers.** | lin | = linear taper | piv | = peak inverse voltage | tol | = tolerance |
| | | log | = logarithmic taper | pos | = position(s) | trim | = trimmer |
| | | m | = milli = $10^{-3}$ | poly | = polystyrene | twt | = traveling wave tube |
| | | M | = megohms | pot | = potentiometer | var | = variable |
| | | ma | = milliamperes | rect | = rectifier | w/ | = with |
| | | $\mu$ | = micro = $10^{-6}$ | | | W | = watts |
| | | minat | = miniature | | | ww | = wirewound |
| | | mfgl | = metal film on glass | | | w/o | = without |
| | | mfr | = manufacturer | | | * | = optimum value selected at factory, average value shown (part may be omitted) |

Table 6-1. Reference Designation Index

| Circuit Reference | HP Stock No. | Description# | Note |
|---|---|---|---|
| AT1 | | PWR SET attenuator assembly (not field replaceable) | |
| AT2 | | RF attenuator assembly (not field replaceable) | |
| B1 | 3140-0052 | Motor, fan | |
| | 3160-0012 | Blade, fan | |
| C1 | 0180-0019 | C: fxd, elect, 45μf -10% +50%, 450 vdcw | |
| C2, 3 | | Not Assigned | |
| C4, 5 | 0150-0012 | C: fxd, cer, 0.01μf ±20%, 1000 vdcw | |
| C6, 7 | 0180-0019 | C: fxd, elect, 45μf -10% +50%, 450 vdcw | |
| C8 | 0150-0012 | C: fxd, cer, 0.01μf ±20%, 1000 vdcw | |
| C9A, B | 0160-0089 | C: fxd, paper, 2 sect., 0.1μf/sect, -10% +20%, 1000 vdcw | |
| C10, 11 | 0180-0019 | C: fxd, elect, 45μf -10% +50%, 450 vdcw | |
| C12 | 0150-0012 | C: fxd, cer, 0.01μf ±20%, 1000 vdcw | |
| C13, 14 | | Not Assigned | |
| C15 | 0140-0028 | C: fxd, mica, 560pf ±10%, 500 vdcw | |
| C16 | 0140-0071 | C: fxd, sil mica, 5600pf ±10%, 500 vdcw | |
| C17 | 0160-0050 | C: fxd, paper, 0.1μf ±10%, 400 vdcw | |
| C18, 19 | 0150-0011 | C: fxd, $TiO_2$, 1.5pf ±20%, 500 vdcw | |
| C20 | 0140-0071 | C: fxd, sil mica, 5600pf ±10%, 500 vdcw | |
| C21 | 0140-0028 | C: fxd, mica, 560pf ±10%, 500 vdcw | |
| C22 | 0160-0050 | C: fxd, paper, 0.1μf ±10%, 400 vdcw | |
| C23 | 0150-0012 | C: fxd, cer, 0.01μf ±20%, 1000 vdcw | |
| C24 | 0140-0035 | C: fxd, mica, 39pf ±5%, 500 vdcw | |
| C25 | 0140-0032 | C: fxd, mica, 47pf ±10%, 500 vdcw | |
| C26 | 0140-0044 | C: fxd, mica, 560pf ±10% | |
| C27 | 0140-0041 | C: fxd, mica, 100pf ±10%, 500 vdcw | |
| C28 | 0160-0050 | C: fxd, paper, 0.1μf ±10%, 400 vdcw | |
| C29 | 0140-0031 | C: fxd, mica, 220pf ±10%, 500 vdcw | |
| C30 | 0140-0044 | C: fxd, mica, 560pf ±10% | |
| C31 | 0150-0012 | C: fxd, cer, 0.01μf ±20%, 1000 vdcw | |
| C32 | 0140-0041 | C: fxd, mica, 100pf ±10%, 500 vdcw | |
| C33, 34, | 0160-0050 | C: fxd, paper, 0.1μf ±10%, 400 vdcw | |
| C35 | 0160-3192 | C: fxd, paper, 0.1μf ±10%, 1200 vdcw | |
| C36 | 0160-0088 | C: fxd, paper, 0.25μf ±10%, 1500 vdcw | |

# See introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

| Circuit Reference | HP Stock No. | Description # | Note |
|---|---|---|---|
| C37A, B | 0160-0089 | C: fxd, paper, 2 sect., 0.1μf/sect, -10% +20%, 1000 vdcw | |
| C38 | 0140-0027 | C: fxd, mica, 470pf ±10%, 500 vdcw | |
| C39 | 0160-0079 | C: fxd, paper, 1μf ±10%, 600 vdcw | |
| C40 | 0170-0055 | C: fxd, cer, 0.1μf ± 20%, 1000 vdcw | |
| C41 | 0140-0007 | C: fxd, mica, 680pf ±10%, 500 vdcw | |
| C42, 43 | 0150-0012 | C: fxd, cer, 0.01μf ±20%, 1000 vdcw | |
| C44 | | Not Assigned | |
| C45 | 0140-0021 | C: fxd, mica, 39pf ±10%, 500 vdcw | |
| C46A/B, 47A/B | 0180-0125 | C: fxd, elect, 4 sect., 20μf/sect, 450 vdcw | |
| C48 | 0140-0021 | C: fxd, mica, 39pf ±10%, 500 vdcw | |
| CR1 | 1910-0016 | Diode, Ge | |
| CR2 thru CR15 | 1901-0029 | Diode, Si | |
| DS1 | 2140-0244 | Lamp: Glow | |
| F1 | 2110-0055 | Fuse, cartridge: 4 amp, (For 115 V operation) | |
| | 2110-0002 | Fuse, cartridge: 2 amp, (For 230 V operation) | |
| J1 | 1251-2357 | Connector: AC Receptacle 3 pin male | |
| J2 | 1251-0007 | Connector, female: 16 contact | |
| J3 thru J6 | 1200-0005 | Socket, tube: octal | |
| J7 | 1250-0035 | Socket, tube | |
| J8 thru J10 | 1250-0075 | Connector: BNC panel jack | |
| J11 | 1250-0074 | Connector, female: BNC | |
| K1 | 0490-0009 | Relay: time delay, SPST | |
| L1 | 9110-0011 | Reactor, filter: 6 h | |
| L2 | 9140-0022 | Inductor, RF: 500 μh | |
| L3 | 9140-0019 | Inductor, RF: 200 μh | |
| L4 | 9140-0020 | Inductor, RF: 400 μh | |
| L5 | 9140-0021 | Inductor, RF: 430 μh | |
| L6 | 9140-0019 | Inductor, RF: 200 μh | |
| M1 | 1120-0037 | Meter, PWR SET | |

# See introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

| Circuit Reference | HP Stock No. | Description # | Note |
|---|---|---|---|
| P1 | 8120-1348 | Power cable: Detachable | |
| P2 | 1251-0006 | Connector, male: 16 contact | |
| P3 thru P6 | 1251-0026 | Connector, male: octal | |
| P7 | 1251-0052 | Connector, male: 11 pin | |
| R1 | 0816-0006 | R: fxd, ww, 5K ohms ±10%, 10 W | |
| R2 | 0687-1551 | R: fxd, comp, 1.5M ±10%, 1/2 W | |
| R3 | 0687-1051 | R: fxd, comp, 1M ±10%, 1/2 W | |
| R4 | 0687-6831 | R: fxd, comp, 68K ohms ±10%, 1/2 W | |
| R5 | 0730-0096 | R: fxd, dep c, 683.7K ohms ±1%, 1 W | |
| R6 | | Not Assigned | |
| R7 | 0693-3331 | R: fxd, comp, 33K ohms ±10%, 2 W | |
| R8 | 0815-0003 | R: fxd, ww, 4K ohms ±5%, 10 W | |
| R9 | 0816-0006 | R: fxd, ww, 5K ohms ±10%, 10 W | |
| R10, 11 | 0690-1051 | R: fxd, comp, 1M ±10%, 1 W | |
| R12 | 0690-5641 | R: fxd, comp, 560K ohms ±10%, 1 W | |
| R13 | 0693-3341 | R: fxd, comp, 330K ohms ±10%, 2 W | |
| R14 | 0686-3635 | R: fxd, comp, 36K ohms ±5%, 1/2 W | |
| R15 | 0730-0103 | R: fxd, dep c, 900K ohms ±1%, 1 W | |
| R16 | 0727-0253 | R: fxd, dep c, 750K ohms ±1%, 1/2 W | |
| R17 | | Not Assigned | |
| R18 | 0690-1001 | R: fxd, comp, 10 ohms ±10%, 1 W | |
| R19, 20 | 0690-1051 | R: fxd, comp, 1M ±10%, 1 W | |
| R21 | 0690-3341 | R: fxd, comp, 330K ohms ±10%, 1 W | |
| R22 | 0693-1541 | R: fxd, comp, 150K ohms ±10%, 2 W | |
| R23 | 0690-1041 | R: fxd, comp, 100K ohms ±10%, 1 W | |
| R24 | 0687-3931 | R: fxd, comp, 39K ohms ±10%, 1/2 W | |
| R25, 26 | 0690-2241 | R: fxd, comp, 220K ohms ±10%, 1 W | |
| R27 | 0730-0092 | R: fxd, dep c, 490K ohms ±1%, 1 W | |
| R28 | 2100-0098 | R: var, comp, lin, 20K ohms ±20% | |
| R29 | 0730-0062 | R: fxd, dep c, 80K ohms ±1%, 1 W | |
| R30 | 0730-0093 | R: fxd, dep c, 516K ohms ±1%, 1W | |
| R31 | 0690-1001 | R: fxd, comp, 10 ohms ±10%, 1 W | |
| R32, 33 | 0687-1011 | R: fxd, comp, 100 ohms ±10%, 1/2 W | |
| R34 | 2100-0034 | R: var, comp, lin; 250K ohms ±10% | |

# See introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

| Circuit Reference | HP Stock No. | Description # | Note |
|---|---|---|---|
| R35 | 0686-1555 | R: fxd, comp, 1.5M ±5%, 1/2 W | |
| R36 | 0687-1051 | R: fxd, comp, 1M ±10%, 1/2 W | |
| R37, 38 | 0687-2241 | R: fxd, comp, 220K ohms ±10%, 1/2 W | |
| R39, 40 | 0690-1031 | R: fxd, comp, 10K ohms ±10%, 1 W | |
| R41* | 0777-0002 | R: fxd, mfgl, 75K ohms ±5%, 7 W (Factory Selected Part, Typical Value Given) | |
| R42 | 0686-1555 | R: fxd, comp, 1.5M ±5%, 1/2 W | |
| R43 | 0730-0110 | R: fxd, dep c, 1.63M ±1%, 1 W | |
| R44 | 2100-0096 | R: var, comp, lin, 1M ±30%, 1/4 W | |
| R45 | 0730-0087 | R: fxd, dep c, 370K ohms ±1%, 1 W | |
| R46 | 0727-0252 | R: fxd, dep c, 740K ohms ±1%, 1/2 W | |
| R47 | 0687-1031 | R: fxd, comp, 10K ohms ±10%, 1 W | |
| R48 | 0687-3321 | R: fxd, comp, 3.3K ohms ±10%, 1/2 W | |
| R49 | 0770-0004 | R: fxd, mfgl, 10K ohms ±5%, 4 W | |
| R50 | 0727-0223 | R: fxd, dep c, 216.3K ohms ±1%, 1/2 W | |
| R51 | 0693-6821 | R: fxd, comp, 6.8K ohms ±10%, 2 W | |
| R52 | 0730-0080 | R: fxd, dep c, 245K ohms, ±1%, 1W | |
| R53 | 0730-0082 | R: fxd, dep c, 265K ohms ±1%, 1W | |
| R54 | 0687-4731 | R: fxd, comp, 47K ohms ±10%, 1/2 W | |
| R55 | 0690-1221 | R: fxd, comp, 1.2K ohms ±10%, 1 W | |
| R56 | 0687-1521 | R: fxd, comp, 1.5K ohms ±10%, 1/2 W | |
| R57 | 0687-1541 | R: fxd, comp, 150K ohms ±10%, 1/2 W | |
| R58 | 0687-1041 | R: fxd, comp, 100K ohms ±10%, 1/2 W | |
| R60 | 0687-3951 | R: fxd, comp, 3.9M ±10%, 1/2 W | |
| R61 | 0687-8211 | R: fxd, comp, 820 ohms ±10%, 1/2 W | |
| R62 | 0693-1531 | R: fxd, comp, 15K ohms ±10%, 2 W | |
| R63 | 0690-1031 | R: fxd, comp, 10K ohms ±10%, 1 W | |
| R64 | 0777-0002 | R: fxd, mfgl, 75K ohms ±5%, 7 W | |
| R65 | 0690-4751 | R: fxd, comp, 4.7M ±10%, 1 W | |
| R66 | 0687-1041 | R: fxd, comp, 100K ohms ±10%, 1/2 W | |
| R68 | 0687-1541 | R: fxd, comp, 150K ohms ±10%, 1/2 W | |
| R69 | 0687-5631 | R: fxd, comp, 56K ohms ±10%, 1/2 W | |
| R70 | 0687-2251 | R: fxd, comp, 2.2M ±10%, 1/2 W | |
| R71, 72 | 0687-1221 | R: fxd, comp, 1.2K ohms ±10%, 1/2 W | |
| R73 | 0687-1521 | R: fxd, comp, 1.5K ohms ±10%, 1/2 W | |
| R74 | 0693-1231 | R: fxd, comp, 12K ohms ±10%, 2 W | |
| R75 | 0687-3921 | R: fxd, comp, 3.9K ohms ±10%, 1/2 W | |

# See introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

| Circuit Reference | HP Stock No. | Description # | Note |
|---|---|---|---|
| R76 | 0687-1041 | R: fxd, comp, 100K ohms ±10%, 1/2 W | |
| R77 | 0777-0002 | R: fxd, mfgl, 75K ohms ±5%, 7 W | |
| R78 | 2100-0096 | R: var, comp, lin, 1M ±30%, 1/4 W | |
| R79 | 0687-4741 | R: fxd, comp, 470K ohms ±10%, 1/2 W | |
| R80 | 2100-0014 | R: var, comp, 220K ohms ±20% | |
| R81, 82 | 0687-2731 | R: fxd, comp, 27K ohms ±10%, 1/2 W | |
| R83 | 2100-0014 | R: var, comp, 220K ohms ±20% | |
| R84 | 0687-3941 | R: fxd, comp, 390Kohms ±10%, 1/2 W | |
| R85 | 2100-0096 | R: var, comp, lin, 1M ±30%, 1/4 W | |
| R86 | 0690-2231 | R: fxd, comp, 22K ohms ±10%, 1 W | |
| R87 | 2100-0045 | R: var, comp, 100K ohms ±10% | |
| R88, 89 | 2100-0028 | R: var, comp, 50K ohms ±10% | |
| R90 | 0690-1031 | R: fxd, comp, 10K ohms ±10%, 1 W | |
| R91 | 0690-6821 | R: fxd, comp, 6800 ohms, 10%, 1W | |
| R92, 93 | 2100-0028 | R: var, comp, 50K ohms ±10% | |
| R94 | 0693-1831 | R: fxd, comp, 18K ohms ±10%, 2 W | |
| R95 | 2100-0028 | R: var, comp, 50K ohms ±10% | |
| R96 | 2100-0120 | R: var, ww, 100K ohms tapped at 50K ohms, ±5%, 8 W | |
| R97 | 2100-0036 | R: var, comp, lin, 1K ohms | |
| R98 | 2100-0025 | R: var, comp, lin, 1.5K ohms ±10% | |
| R99 | 0687-3901 | R: fxd, comp, 39 ohms ±10%, 1/2 W | |
| R100 | 0687-3301 | R: fxd, comp, 33 ohms ±10%, 1/2 W | |
| R101 | 0687-4711 | R: fxd, comp, 470 ohms ±10%, 1/2 W | |
| R102 | | Not Assigned | |
| R103, 104 | 628A-67A | R: fxd, ww, 200 ohms | |
| R105 | 0687-2201 | R: fxd, comp, 22 ohms ±10%, 1/2 W | |
| R106 | | Not Assigned | |
| R107 | 0687-2211 | R: fxd, comp, 220 ohms ±10%, 1/2 W | |
| R108 | 2100-0068 | R: var, comp, lin, 500 ohms | |
| R109 | 628A-67A | R: fxd, ww, 200 ohms | |
| R110 | 0687-8231 | R: fxd, comp, 82K ohms ±10%, 1/2 W | |
| R111 | 0687-1051 | R: fxd, comp, 1M ±10%, 1/2 W | |
| R112 | 0687-2731 | R: fxd, comp, 27K ohms ±10%, 1/2 W | |
| R113 | 2100-0034 | R: var, comp, lin, 250K ohms ±10% | |

# See introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

| Circuit Reference | HP Stock No. | Description# | Note |
|---|---|---|---|
| R114 | 0687-1051 | R: fxd, comp, 1M ±10%, 1/2 W | |
| R115 | 2100-0047 | R: var, 1M ±20%, 2 W | |
| R116 | | Not Assigned | |
| R117 | 0730-0131 | R: fxd, dep c, 7.5M ±10%, 1 W | |
| R118 | 0727-0291 | R: fxd, dep c, 2.84M ±10%, 1/2 W | |
| R119 | 0770-0002 | R: fxd, mfgl, 2.4 ohms ±5%, 4 W | |
| R120 | 0770-0003 | R: fxd, mfgl, 3.3 ohms ±5%, 4 W | |
| R121 | 0727-0292 | R: fxd, dep c, 3M ±1%, 1/2 W | |
| R122 | 0727-0281 | R: fxd, dep c, 1.39M ±1%, 1/2 W | |
| R123 | | Not Assigned | |
| R124 | 0687-4731 | R: fxd, comp, 47K ohms ±10%, 1/2 W | |
| R125 | 0687-1051 | R: fxd, comp, 1M ±10%, 1/2 W | |
| R126, 127 | 0687-3951 | R: fxd, comp, 3.9M ±10% 1/2 W | |
| R128 | 0687-1031 | R: fxd, comp, 10K ohms ±10%, 1/2 W | |
| R129, 130 | 0687-1011 | R: fxd, comp, 100 ohms ±10%, 1/2 W | |
| R131* | 0693-1801 | R: fxd, comp, 18 ohms ±10%, 2 W (2 per) | |
| R132 thru 139 | 0690-4741 | R: fxd, comp, 470K ohms ±10%, 1 W | |
| R140, 141 | 0690-1051 | R: fxd, comp, 1M ±10%, 1 W | |
| R142 | 0757-0123 | R: fxd, met flm, 34.8K ohm, 1%, 1/8 W | |
| RT1 | 0852-0007 | Tube, ballast, No. 13-4 | |
| RT2 thru 101 | | Not Assigned | |
| RT102 | 0839-0003 | Thermistor, disc | |
| RT103 thru 105 | | Not Assigned | |
| RT106 | 0839-0003 | Thermistor, disc | |
| RT107 thru 122 | | Not Assigned | |
| RT123 | 0839-0022 | Thermistor, | |
| S1 | 3101-1248 | Switch, Push button | |
| S2A, B, C, D | 3100-0121 | Switch, rot: (SYNC SEL.) 2 sect | |
| S3 | 3100-0111 | Switch, rot: (MOD. SEL.) 3 sect | |
| S4 | 3102-0001 | Switch, micro: SPST, 10 amp | |
| | 3102-0002 | S4 Actuator | |
| S5 | 3101-1272 | Switch: 4PDT slide | |
| T1 | 9100-0114 | Transformer, power | |
| T2 | 9100-0115 | Transformer, power | |

# See introduction to this section

Table 6-1. Reference Designation Index (Cont'd)

| Circuit Reference | HP Stock No. | Description # | Note |
|---|---|---|---|
| V1 | 1932-0010 | Tube, electron: 6080 | |
| V2 | 1923-0021 | Tube, electron: 6AU6 | |
| V3 | 1940-0004 | Tube, electron: OA2 | |
| V4 | 1923-0021 | Tube, electron: 6AU6 | |
| V5 | 1923-0018 | Tube, electron: 6AQ5 | |
| V6 | 1923-0021 | Tube, electron: 6AU6 | |
| V7 | 1940-0001 | Tube, electron: 5651 | |
| V8 | 1930-0013 | Tube, electron: 6AL5 | |
| V9, 10 | 1032-0027 | Tube, electron: 12AT7 | |
| V11 | 1941-0005 | Tube, electron: 2D21 | |
| V12 | 1930-0013 | Tube, electron: GAL5 | |
| V13 | 1932-0027 | Tube, electron: 12AT7 | |
| V14 | 1941-0005 | Tube, electron: 2D21 | |
| V15 | 1932-0027 | Tube, electron: 12AT7 | |
| V16 | 1930-0016 | Tube, electron: 6X4 | |
| V17 | | Tube, klystron: (nsr)<br>Part of klystron cavity assembly.) | |
| V18 | 1932-0002 | Tube, electron: 5687 | |

# See introduction to this section

Table 6-2. Replaceable Parts

| HP Stock No. | Description # | Mfr. | Mfr. Part No. | TQ | RS | | |
|---|---|---|---|---|---|---|---|
| 628A-67A | R: fxd, ww, 200 ohms | 28480 | 628A-67A | 3 | 1 | | |
| 0140-0003 | C: fxd, mica, 1000pf ±10%, 500 vdcw | 76433 | RCM30B10ZK | 2 | 1 | | |
| 0140-0007 | C: fxd, mica, 680pf ±10%, 500 vdcw | 00853 | K1368B10 | 1 | 1 | | |
| 0140-0021 | C: fxd, mica, 39pf ±10%, 500 vdcw | 00853 | DR1439B10 | 1 | 1 | | |
| 0140-0027 | C: fxd, mica, 470pf ±10%, 500 vdcw | 11711 | CM20B471KN3 | 1 | 1 | | |
| 0140-0028 | C: fxd, mica, 560pf ±10%, 500 vdcw | 72136 | CM308561K | 2 | 1 | | |
| 0140-0031 | C: fxd, mica, 220pf ±10%, 500 vdcw | 76433 | RCM20B221K | 1 | 1 | | |
| 0140-0032 | C: fxd, mica, 47pf ±10%, 500 vdcw | 76433 | RCM20B470K | 1 | 1 | | |
| 0140-0035 | C: fxd, mica, 39pf ±5%, 500 vdcw | 76433 | RCM15E390J | 1 | 1 | | |
| 0140-0041 | C: fxd, mica, 100pf ±10%, 500 vdcw | 76433 | RCM15E101J | 2 | 1 | | |
| 0140-0071 | C: fxd, sil mica, 5600pf ±1%, 500 vdcw | 00656 | 1464TTMC24345 | 2 | 1 | | |
| 0150-0011 | C: fxd, $TiO_2$, 1.5pf ±20%, 500 vdcw | 78488 | Type GA | 2 | 1 | | |
| 0150-0012 | C: fxd, cer, 0.01μf ±20%, 1000 vdcw | 56289 | 29C214A-3-H-1038 | 9 | 2 | | |
| 0160-0050 | C: fxd, paper, 0.1μf ±10%, 400 vdcw | 00656 | V161D | 5 | 2 | | |
| 0160-0079 | C: fxd, paper, 1μf ±10%, 600 vdcw | 24446 | 23F467 | 1 | 1 | | |
| 0160-0088 | C: fxd, paper, 0.25μf ±10%, 1500 vdcw | 24446 | 22F21 | 1 | 1 | | |
| 0160-0089 | C: fxd, paper, 2 sect, 0.1 μf/sect, | 00853 | obd# | 2 | 1 | | |
| 0160-3192 | C: fxd, paper, 0.1μf ± 20%, 1200 vdcw | 01884 | LP 104 18M | 1 | 1 | | |
| 0180-0019 | C: fxd, elect, 45μf -10% +50%, 450 vdcw | 14655 | CE41F450R | 5 | 2 | | |
| 0180-0125 | C: fxd, elect, 4 sect., 20μf/sect, 450 vdcw | 00853 | type PL1 | 2 | 1 | | |
| 0490-0009 | Relay: time delay, SPST | 70563 | 115N030T | 1 | 1 | | |
| 0686-1555 | R: fxd, comp, 1.5M ±5%, 1/2 W | 01121 | EB 1555 | 2 | 1 | | |
| 0686-3635 | R: fxd, comp, 36K ohms ±5%, 1/2 W | 01121 | EB 3635 | 1 | 1 | | |
| 0687-1011 | R: fxd, comp, 100 ohms ±10%, 1/2 W | 01121 | EB 1011 | 4 | 1 | | |
| 0687-1031 | R: fxd, comp, 10K ohms ±10%, 1/2 W | 01121 | EB 1031 | 2 | 1 | | |
| 0687-1041 | R: fxd, comp, 100K ohms ±10%, 1/2 W | 01121 | EB 1041 | 5 | 2 | | |
| 0687-1051 | R: fxd, comp, 1M ±10%, 1/2 W | 01121 | EB 1051 | 5 | 2 | | |
| 0687-1221 | R: fxd, comp, 1.2K ohms ±10%, 1/2 W | 01121 | EB 1221 | 2 | 1 | | |
| 0687-1521 | R: fxd, comp, 1.5K ohms ±10%, 1/2 W | 01121 | EB 1521 | 2 | 1 | | |
| 0687-1541 | R: fxd, comp, 150K ohms ±10%, 1/2 W | 01121 | EB 1541 | 2 | 1 | | |
| 0687-1551 | R: fxd, comp, 1.5M ±10%, 1/2 W | 01121 | EB 1551 | 1 | 1 | | |

#See introduction to this section

Table 6-2. Replaceable Parts (Cont'd)

| HP Stock No. | Description # | Mfr. | Mfr. Part No. | TQ | RS | | |
|---|---|---|---|---|---|---|---|
| 0687-2201 | R: fxd, comp, 22 ohms ±10%, 1/2 W | 01121 | EB 2201 | 1 | 1 | | |
| 0687-2211 | R: fxd, comp, 220 ohms ±10%, 1/2 W | 01121 | EB 2211 | 1 | 1 | | |
| 0687-2241 | R: fxd, comp, 220K ohms ±10%, 1/2 W | 01121 | EB 2241 | 2 | 1 | | |
| 0687-2251 | R: fxd, comp, 2.2M ±10%, 1/2 W | 01121 | EB 2251 | 1 | 1 | | |
| 0687-2731 | R: fxd, comp, 27K ohms ±10%, 1/2 W | 01121 | EB 2731 | | 1 | | |
| 0687-3301 | R: fxd, comp, 33 ohms ±10%, 1/2 W | 01121 | EB 3301 | 1 | 1 | | |
| 0687-3321 | R: fxd, comp, 3.3K ohms ±10%, 1/2 W | 01121 | EB 3321 | 1 | 1 | | |
| 0687-3341 | R: fxd, comp, 330K ohms ±10%, 1/2 W | 01121 | EB 3341 | 1 | 1 | | |
| 0687-3901 | R: fxd, comp, 39 ohms ±10%, 1/2 W | 01121 | EB 3901 | 1 | 1 | | |
| 0687-3921 | R: fxd, comp, 3.9K ohms ±10%, 1/2 W | 01121 | EB 3921 | 1 | 1 | | |
| 0687-3931 | R: fxd, comp, 39K ohms ±10%, 1/2 W | 01121 | EB3931 | 1 | 1 | | |
| 0687-3941 | R: fxd, comp, 390K ohms ±10%, 1/2W | 01121 | EB 3941 | 1 | 1 | | |
| 0687-3951 | R: fxd, comp, 3.9M ±10%, 1/2 W | 01121 | EB 3951 | 1 | 1 | | |
| 0687-4711 | R: fxd, comp, 470 ohms ±10%, 1/2 W | 01121 | EB 4711 | 1 | 1 | | |
| 0687-4731 | R: fxd, comp, 47K ohms ±10%, 1/2 W | 01121 | EB 4731 | 2 | 1 | | |
| 0687-5631 | R: fxd, comp, 56K ohms ±10%, 1/2 W | 01121 | EB 5631 | 1 | 1 | | |
| 0687-6831 | R: fxd, comp, 68K ohms ±10%, 1/2 W | 01121 | EB 6831 | 1 | 1 | | |
| 0687-8211 | R: fxd, comp, 820 ohms ±10%, 1/2 W | 01121 | EB 8211 | 1 | 1 | | |
| 0687-8231 | R: fxd, comp, 82K ohms ±10%, 1/2 W | 01121 | EB 8231 | 1 | 1 | | |
| 0690-1001 | R: fxd, comp, 10 ohms ±10%, 1 W | 01121 | GB 1001 | 2 | 1 | | |
| 0690-1031 | R: fxd, comp, 10K ohms ±10%, 1 W | 01121 | GB 1031 | 3 | 1 | | |
| 0690-1041 | R: fxd, comp, 100K ohms ±10%, 1 W | 01121 | GB 1041 | 1 | 1 | | |
| 0690-1051 | R: fxd, comp, 1M ±10%, 1 W | 01121 | GB 1051 | 6 | 2 | | |
| 0690-1221 | R: fxd, comp, 1.2K ohms ±10%, 1 W | 01121 | GB 1221 | 1 | 1 | | |
| 0690-2231 | R: fxd, comp, 22K ohms ±10%, 1 W | 01121 | GB 2231 | 1 | 1 | | |
| 0690-2241 | R: fxd, comp, 220K ohms ±10%, 1 W | 01121 | GB 2241 | 2 | 1 | | |
| 0690-3341 | R: fxd, comp, 330K ohms ±10%, 1 W | 01121 | GB 3341 | 1 | 1 | | |
| 0690-4751 | R: fxd, comp, 3.9M ±10%, 1 W | 01121 | GB 4751 | 1 | 1 | | |
| 0690-4741 | R: fxd, comp, 470K ohms ±10%, 1 W | 01121 | GB 4741 | 8 | 3 | | |
| 0690-5641 | R: fxd, comp, 560K ohms ±10%, 1 W | 01121 | GB 5641 | 1 | 1 | | |
| 0693-1231 | R: fxd, comp, 12K ohms ±10%, 2 W | 01121 | HB 1231 | 1 | 1 | | |
| 0693-1531 | R: fxd, comp, 15K ohms ±10%, 2 W | 01121 | HB 1531 | 1 | 1 | | |
| 0693-1541 | R: fxd, comp, 150K ohms ±10%, 2 W | 01121 | HB 1541 | 1 | 1 | | |
| 0693-1831 | R: fxd, comp, 18K ohms ±10%, 2 W | 01121 | HB 1831 | 1 | 1 | | |
| 0693-3331 | R: fxd, comp, 33K ohms ±10%, 2 W | 01121 | HB 3331 | 1 | 1 | | |
| 0693-3341 | R: fxd, comp, 330K ohms ±10%, 2 W | 01121 | GB 3341 | 1 | 1 | | |

#See introduction to this section

Table 6-2. Replaceable Parts (Cont'd)

| HP Stock No. | Description # | Mfr. | Mfr. Part No. | TQ | RS | | |
|---|---|---|---|---|---|---|---|
| 0693-6801 | R: fxd, comp, 68 ohms ±10%, 2 W | 01121 | HB 6801 | 1 | 1 | | |
| 0693-6821 | R: fxd, comp, 6.8K ohms ±10%, 2 W | 01121 | HB 6821 | 1 | 1 | | |
| 0727-0223 | R: fxd, dep c, 216.3K ohms ±1%, 1/2 W | 19701 | DC1/2BR5 obd# | 1 | 1 | | |
| 0727-0244 | R: fxd, dep c, 500K ohms ±10%, 1/2 W | 19701 | DC1/2AR5 obd# | 1 | 1 | | |
| 0727-0252 | R: fxd, dep c, 740K ohms ±1%, 1/2 W | 19701 | DC1/2AR5 obd# | 1 | 1 | | |
| 0727-0253 | R: fxd, dep c, 750K ohms ±1%, 1/2 W | 19701 | DC1/2AR5 obd# | 1 | 1 | | |
| 0727-0281 | R: fxd, dep c, 1.39M ±1%, 1/2 W | 19701 | DC1/2AR5 obd# | 1 | 1 | | |
| 0727-0291 | R: fxd, dep c, 2.84M ±1%, 1/2 W | 19701 | DC1/2R5 obd# | 1 | 1 | | |
| 0727-0292 | R: fxd, dep c, 3M ±1%, 1/2 W | 19701 | DC1/2CR5 obd# | 1 | 1 | | |
| 0730-0062 | R: fxd, dep c, 80K ohms ±1%, 1 W | 19701 | DC1R5 obd# | 1 | 1 | | |
| 0730-0079 | R: fxd, dep c, 216.3K ohms ±1%, 1 W | 19701 | DC125 obd# | 1 | 1 | | |
| 0730-0087 | R: fxd, dep c, 370K ohms ±1%, 1 W | 19701 | DC1R5 obd# | 1 | 1 | | |
| 0730-0092 | R: fxd, dep c, 490K ohms ±1%, 1 W | 19701 | DC1R5 obd# | 1 | 1 | | |
| 0730-0096 | R: fxd, dep c, 683.7K ohms ±1%, 1 W | 19701 | DC125 obd# | 1 | 1 | | |
| 0730-0100 | R: fxd, dep c, 800K ohms ±1%, 1 W | 19701 | DC1R5 obd# | 1 | 1 | | |
| 0730-0110 | R: fxd, dep c, 1.63M ±1%, 1 W | 19701 | DC1R5 obd# | 1 | 1 | | |
| 0730-0131 | R: fxd, dep c, 7.5M ±1%, 1 W | 19701 | DC1R5 obd# | 1 | 1 | | |
| 0770-0002 | R: fxd, mfgl, 2.4 ohms ±5%, 4 W | 07115 | type LP1-4 obd# | 1 | 1 | | |
| 0770-0003 | R: fxd, mfgl, 3.3 ohms ±5%, 4 W | 07115 | LP1-4 obd# | 1 | 1 | | |
| 0770-0004 | R: fxd, mfgl, 10K ohms ±5%, 4 W | 07115 | LP1-4 obd# | 1 | 1 | | |
| 0773-0009 | R: fxd, mfgl, 66K ohms ±5%, 5 W | 07115 | type LP1-5 obd# | 3 | 1 | | |
| 0815-0003 | R: fxd, ww, 4K ohms ±5%, 10 W | 75042 | type 1-3/4A | 1 | 1 | | |
| 0816-0006 | R: fxd, ww, 5K ohms ±10%, 10 W | 35434 | type C-10 | 2 | 1 | | |
| 0839-0003 | Thermistor, disc | 83186 | 27D1 | 2 | 2 | | |
| 0839-0022 | Thermistor, | 83186 | 32A5 04 | 1 | 0 | | |
| 0852-0007 | Tube, ballast, No. 13-4 | 70563 | 13-4 | 1 | 1 | | |
| 1120-0037 | Meter, PWR SET | 65092 | Model 506 | 1 | 1 | | |
| 1200-0005 | Socket, tube: octal | 71785 | 101-29-11-024 | 4 | 1 | | |
| 1200-0035 | Socket, tube | 02660 | 77M1P-11T | 1 | 1 | | |
| 1250-0074 | Connector, female: BNC | 91737 | UG-290/U | 1 | 1 | | |

#See introduction to this section

Table 6-2. Replaceable Parts (Cont'd)

| HP Stock No. | Description # | Mfr. | Mfr. Part No. | TQ | RS | | |
|---|---|---|---|---|---|---|---|
| 1250-0075 | Connector: BNC panel jack | 91737 | UG-291/U | 3 | 1 | | |
| 1251-0006 | Connector, male: 16 contact | 02660 | 26-4100-116P | 1 | 1 | | |
| 1251-0007 | Connector, female: 16 contact | 02660 | 26-4200-165 | 1 | 1 | | |
| 1251-0026 | Connector, male: octal | 02660 | 86CP11T-041-2 obd# | 4 | 1 | | |
| 1251-0052 | Connector, male: 11 pin | 02660 | 86CP11T-041-2 obd# | 1 | 1 | | |
| 1901-0029 | Diode, Si | 02735 | obd# | 14 | 14 | | |
| 1910-0016 | Diode, Ge | 73293 | HD2135A | 1 | 1 | | |
| 1923-0018 | Tube, electron: 6AQ5 | 82219 | obd# | 1 | 1 | | |
| 1923-0021 | Tube, electron: 6AU6 | 82219 | obd# | 3 | 3 | | |
| 1930-0013 | Tube, electron: 6AL5 | 33173 | obd# | 2 | 2 | | |
| 1930-0016 | Tube, electron: 6X4 | 33173 | obd# | 1 | 1 | | |
| 1932-0002 | Tube, electron: 5687 | 33173 | obd# | 1 | 1 | | |
| 1932-0010 | Tube, electron: 6080 | 86684 | obd# | 1 | 1 | | |
| 1932-0027 | Tube, electron: 12AT7 | 0000I | 12AT7 | 4 | 4 | | |
| 1940-0001 | Tube, electron: 5651 | 86684 | 5651 | 1 | 1 | | |
| 1940-0004 | Tube, electron: OA2 | 86684 | obd# | 1 | 1 | | |
| 1941-0003 | Tube, electron: 5696 | 86684 | 5696 | 2 | 2 | | |
| 2100-0014 | R: var, comp, 200K ohms ±20% | 11237 | obd# | 2 | 1 | | |
| 2100-0025 | R: var, comp, lin, 1.5K ohms ±10% | 01121 | JA1L0405152Z | 1 | 1 | | |
| 2100-0028 | R: var, comp, 50K ohms ±10% | 01121 | JAZL0485503UC | 5 | 2 | | |
| 2100-0034 | R: var, comp, lin, 250K ohms ±10% | 11237 | type 35 | 2 | 1 | | |
| 2100-0036 | R: var, comp, lin, 1K ohms | 71590 | obd# | 1 | 1 | | |
| 2100-0045 | R: var, comp, 100K ohms ±10% | 01121 | JA1N056S104AA | 1 | 1 | | |
| 2100-0047 | R: var, 1M ±20%, 2 W | 01121 | JA1N056S105RZ | 1 | 1 | | |
| 2100-0068 | R: var, comp, lin, 500 ohms | 01121 | JA1L048S501UC | 1 | 1 | | |
| 2100-0096 | R: var, comp, lin, 1M ±30%, 1/4 W | 11237 | UPE-70 special | 3 | 2 | | |
| 2100-0098 | R: var, comp, lin, 20K ohms ±20% | 11237 | UPM-45 | 1 | 1 | | |
| 2100-0120 | R: var, ww, 100K ohms tapped at 50K ohms, ±5%, 8 W | 98734 | obd# | 1 | 1 | | |
| 2110-0015 | Fuse, cartridge: 2.5 amp, s-b (For 115 V operation) | 75915 | 31302.5 | 1 | 10 | | |
| 2110-0021 | Fuse, cartridge: 1.25 amp, s-b (For 230 V operation) | 71400 | MDL 1.25 | | | | |

#See introduction to this section

Table 6-2. Replaceable Parts (Cont'd)

| HP Stock No. | Description # | Mfr. | Mfr. Part No. | TQ | RS | | |
|---|---|---|---|---|---|---|---|
| 2140-0009 | Lamp, incd: 6-8V type 47 | 24455 | 47 | 1 | 1 | | |
| 3100-0111 | Switch, rot: (MOD SEL.) 3 sect | 76854 | 68732-F3 | 1 | 1 | | |
| 3100-0121 | Switch, rot: (SYNC SEL.) 2 sect | 76854 | 68731-F2 | 1 | 1 | | |
| 3101-0030 | Switch, tog: SPST | 04009 | 82601 | 1 | 1 | | |
| 3102-0001 | Switch, micro SPDT, 10 amp | 91929 | BZ-2RS | 1 | 1 | | |
| 3102-0002 | S4 Actuator | 91929 | JR | | | | |
| 3140-0010 | Motor, fan | 73793 | G5-CW ER-6667 | 1 | 1 | | |
| 3160-0012 | Blade, fan | 06812 | 0-5527-5 | 1 | 1 | | |
| 8120-0015 | Power cable | 70903 | KH3981/PH7C/ 7.5ft. | 1 | 1 | | |
| 9100-0114 | Transformer, power | 98734 | 9018 | 1 | 1 | | |
| 9100-0115 | Transformer, power | 98734 | 9017 | 1 | 1 | | |
| 9110-0011 | Reactor, filter: 6 h | 98734 | 1009 | 1 | 1 | | |
| 9140-0019 | Inductor, RF: 200 μh | 99848 | 1200-15-201 | 2 | 1 | | |
| 9140-0020 | Inductor, RF: 400 μh | 99848 | 1400-15-401 | 1 | 1 | | |
| 9140-0021 | Inductor, RF: 430 μh | 99848 | 3430-15-431 | 1 | 1 | | |
| 9140-0022 | Inductor, RF: 500 μh | 99848 | 150-15-501 | 1 | 1 | | |
| | MISCELLANEOUS | | | | | | |
| G-32H | Coupler, plastic, control shaft (FM AMP, PHASE MOD SEL) | 28480 | G-32H | 2 | 1 | | |
| G-74F | Knob: ZERO SET, OUTPUT ATTEN | 28480 | G-74F | 2 | 1 | | |
| G-74G | Knob: PWR SET, FM AMP, FM PHASE | 28480 | G-74G | 3 | 1 | | |
| G-74H | Knob: PULSE RATE, PULSE DELAY, PULSE WIDTH(stake on) | 28480 | G-74H | 3 | 1 | | |
| G-74N | Knob: SYNC SELECTOR, MOD SELECTOR | 28480 | G-74N | 2 | 1 | | |
| 626A-28 | Thermistor mount assy | 28480 | 626A-28 | 1 | 1 | | |
| 626A-32C | Output connector, waveguide | 28480 | 626A-32C | 1 | 1 | | |

#See introduction to this section

Table 6-2. Replaceable Parts (Cont'd)

| HP Stock No. | Description # | Mfr. | Mfr. Part No. | TQ | RS | | |
|---|---|---|---|---|---|---|---|
| 626A-38A | Wrench, spanner | 28480 | 626A-38A | 1 | 1 | | |
| 626A-38B-1 | Screwdriver | 28480 | 626A-38B-1 | 1 | 1 | | |
| 626A-38B-2 | Wrench Assembly: Tube | 28480 | 626A-38B-2 | 1 | | | |
| 626A-95A | Klystron cavity assy complete w/ klystron (V17) | 28480 | 626A-95A | 1 | 1 | | |
| W33M-2 | Cap, waveguide, plastic molding | 28480 | 4133-0005 | 1 | 1 | | |
| W34M-1 | Plug, waveguide (low dielectric loss) | 28480 | 4054-0003 | 2 | 1 | | |
| 1400-0084 | Fuseholder | 75915 | 342014 | 1 | 1 | | |
| 3150-0002 | Air Filter Adhesive water soluble; 16.5 fl oz can equipped with sprayer applicator. Super Filter Coat Brand | 82866 | obd# | 0 | 1 | | |
| 626A-65D | Printed circuit board, pulse section complete with components | 28480 | | 1 | | | |
| 626A-65E | Printed circuit board, power supply section, complete with components | 28480 | | 1 | | | |
| 626A-65F | Printed circuit board, modulator section, complete with components | 28480 | | 1 | | | |

#See introduction to this section

# APPENDIX
# CODE LIST OF MANUFACTURERS (Sheet 1 of 2)

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 handbooks.

| CODE NO. | MANUFACTURER | ADDRESS |
|---|---|---|
| 00334 | Humidial Co. | Colton, Calif. |
| 00335 | Westrex Corp. | New York, N.Y. |
| 00373 | Garlock Packing Co., Electronic Products Div. | Camden, N.J. |
| 00656 | Aerovox Corp. | New Bedford, Mass. |
| 00779 | Amp, Inc. | Harrisburg, Pa. |
| 00781 | Aircraft Radio Corp. | Boonton, N.J. |
| 00853 | Sangamo Electric Company, Ordill Division (Capacitors) | Marion, Ill. |
| 00866 | Goe Engineering Co. | Los Angeles, Calif. |
| 00891 | Carl E. Holmes Corp. | Los Angeles, Calif. |
| 01121 | Allen Bradley Co. | Milwaukee, Wis. |
| 01255 | Litton Industries, Inc. | Beverly Hills, Calif. |
| 01281 | Pacific Semiconductors, Inc. | Culver City, Calif. |
| 01295 | Texas Instruments, Inc. Transistor Products Div. | Dallas, Texas |
| 01349 | The Alliance Mfg. Co. | Alliance, Ohio |
| 01561 | Chassi-Trak Corp. | Indianapolis, Ind. |
| 01589 | Pacific Relays, Inc. | Van Nuys, Calif. |
| 01930 | Amerock Corp. | Rockford, Ill. |
| 01961 | Pulse Engineering Co. | Santa Clara, Calif. |
| 02114 | Ferroxcube Corp. of America | Saugerties, N.Y. |
| 02286 | Cole Mfg. Co. | Palo Alto, Calif. |
| 02660 | Amphenol-Borg Electronics Corp. | Chicago, Ill. |
| 02735 | Radio Corp. of America Semiconductor and Materials Div. | Somerville, N.J. |
| 02771 | Vocaline Co. of America, Inc. | Old Saybrook, Conn. |
| 02777 | Hopkins Engineering Co. | San Fernando, Calif. |
| 03508 | G.E. Semiconductor Products Dept. | Syracuse, N.Y. |
| 03705 | Apex Machine & Tool Co. | Dayton, Ohio |
| 03797 | Eldema Corp. | El Monte, Calif. |
| 03877 | Transitron Electronic Corp. | Wakefield, Mass. |
| 03888 | Pyrofilm Resistor Co. | Morristown, N.J. |
| 03954 | Air Marine Motors, Inc. | Los Angeles, Calif. |
| 04009 | Arrow, Hart and Hegeman Elect. Co. | Hartford, Conn. |
| 04062 | Elmenco Products Co. | New York, N.Y. |
| 04222 | Hi-Q Division of Aerovox | Myrtle Beach, S.C. |
| 04298 | Elgin National Watch Co., Electronics Division | Burbank, Calif. |
| 04404 | Dymec Division of Hewlett-Packard Co. | Palo Alto, Calif. |
| 04651 | Sylvania Electric Prods., Inc. Electronic Tube Div. | Mountain View, Calif. |
| 04713 | Motorola, Inc., Semiconductor Prod. Div. | Phoenix, Arizona |
| 04732 | Filtron Co., Inc. Western Division | Culver City, Calif. |
| 04773 | Automatic Electric Co. | Northlake, Ill. |
| 04796 | Sequoia Wire & Cable Company | Redwood City, Calif. |
| 04870 | P M Motor Co. | Chicago, Ill. |
| 05006 | Twentieth Century Plastics, Inc. | Los Angeles, Calif. |
| 05277 | Westinghouse Electric Corp., Semi-Conductor Dept. | Youngwood, Pa. |
| 05347 | Ultronix, Inc. | San Mateo, Calif. |
| 05593 | Illumitronic Engineering Co. | Sunnyvale, Calif. |
| 05624 | Barber Colman Co. | Rockford, Ill. |
| 05729 | Metropolitan Telecommunications Corp., Metro Cap. Div. | Brooklyn, N.Y. |
| 05783 | Stewart Engineering Co. | Santa Cruz, Calif. |
| 06004 | The Bassick Co. | Bridgeport, Conn. |
| 06555 | Beede Electrical Instrument Co., Inc. | Penacook, N.H. |
| 06812 | Torrington Mfg. Co., West Div. | Van Nuys, Calif. |
| 07115 | Corning Glass Works Electronic Components Dept. | Bradford, Pa. |
| 07126 | Digitran Co. | Pasadena, Calif. |
| 07137 | Transistor Electronics Corp. | Minneapolis, Minn. |
| 07138 | Westinghouse Electric Corp. Electronic Tube Div. | Elmira, N.Y. |
| 07261 | Avnet Corp. | Los Angeles, Calif. |
| 07263 | Fairchild Semiconductor Corp. | Mountain View, Calif. |
| 07910 | Continental Device Corp. | Hawthorne, Calif. |
| 07933 | Rheem Semiconductor Corp. | Mountain View, Calif. |
| 07966 | Shockley Semi-Conductor Laboratories | Palo Alto, Calif. |
| 07980 | Boonton Radio Corp. | Boonton, N.J. |
| 08145 | U.S. Engineering Co. | Los Angeles, Calif. |
| 08358 | Burgess Battery Co. | Niagara Falls, Ontario, Canada |
| 08717 | Sloan Company | Burbank, Calif. |
| 08718 | Cannon Electric Co. Phoenix Div. | Phoenix, Ariz. |
| 08792 | CBS Electronics Semiconductor Operations, Div. of C.B.S. Inc. | Lowell, Mass. |
| 08984 | Mel-Rain | Indianapolis, Ind. |
| 09026 | Babcock Relays, Inc. | Costa Mesa, Calif. |
| 09134 | Texas Capacitor Co. | Houston, Texas |
| 09250 | Electro Assemblies, Inc. | Chicago, Ill. |
| 09569 | Mallory Battery Co. of Canada, Ltd. | Toronto, Ontario, Canada |
| 10214 | General Transistor Western Corp. | Los Angeles, Calif. |
| 10411 | Ti-Tal, Inc. | Berkeley, Calif. |
| 10646 | Carborundum Co. | Niagara Falls, N.Y. |
| 11236 | CTS of Berne, Inc. | Berne, Ind. |
| 11237 | Chicago Telephone of California, Inc. | So. Pasadena, Calif. |
| 11312 | Microwave Electronics Corp. | Palo Alto, Calif. |
| 11534 | Duncan Electronics, Inc. | Santa Ana, Calif. |
| 11711 | General Instrument Corporation Semiconductor Division | Newark, N.J. |
| 11717 | Imperial Electronics, Inc. | Buena Park, Calif. |
| 11870 | Melabs, Inc. | Palo Alto, Calif. |
| 12697 | Clarostat Mfg. Co. | Dover, N.H. |
| 14655 | Cornell Dubilier Elec. Corp. | So. Plainfield, N.J. |
| 15909 | The Daven Co. | Livingston, N.J. |
| 16688 | De Jur-Amsco Corporation | Long Island City 1, N.Y. |
| 16758 | Delco Radio Div. of G. M. Corp. | Kokomo, Ind. |
| 18873 | E. I. DuPont and Co., Inc. | Wilmington, Del. |
| 19315 | Eclipse Pioneer, Div. of Bendix Aviation Corp. | Teterboro, N.J. |
| 19500 | Thomas A. Edison Industries, Div. of McGraw-Edison Co. | West Orange, N.J. |
| 19701 | Electra Manufacturing Co. | Kansas City, Mo. |
| 20183 | Electronic Tube Corp. | Philadelphia, Pa. |
| 21520 | Fansteel Metallurgical Corp. | No. Chicago, Ill. |
| 21335 | The Fafnir Bearing Co. | New Britain, Conn. |
| 21964 | Fed. Telephone and Radio Corp. | Clifton, N.J. |
| 24446 | General Electric Co. | Schenectady, N.Y. |
| 24455 | G.E., Lamp Division | Nela Park, Cleveland, Ohio |
| 24655 | General Radio Co. | West Concord, Mass. |
| 26462 | Grobet File Co. of America, Inc. | Carlstadt, N.J. |
| 26992 | Hamilton Watch Co. | Lancaster, Pa. |
| 28480 | Hewlett-Packard Co. | Palo Alto, Calif. |
| 33173 | G.E. Receiving Tube Dept. | Owensboro, Ky. |
| 35434 | Lectrohm Inc. | Chicago, Ill. |
| 37942 | P. R. Mallory & Co., Inc. | Indianapolis, Ind. |
| 39543 | Mechanical Industries Prod. Co. | Akron, Ohio |
| 40920 | Miniature Precision Bearings, Inc. | Keene, N.H. |
| 42190 | Muter Co. | Chicago, Ill. |
| 43990 | C. A. Norgren Co. | Englewood, Colo. |
| 44655 | Ohmite Mfg. Co. | Skokie, Ill. |
| 47904 | Polaroid Corp. | Cambridge, Mass. |
| 48620 | Precision Thermometer and Inst. Co. | Philadelphia, Pa. |
| 49956 | Raytheon Company | Lexington, Mass. |
| 54294 | Shallcross Mfg. Co. | Selma, N.C. |
| 55026 | Simpson Electric Co. | Chicago, Ill. |
| 55933 | Sonotone Corp. | Elmsford, N.Y. |
| 55938 | Sorenson & Co., Inc. | So. Norwalk, Conn. |
| 56137 | Spaulding Fibre Co., Inc. | Tonawanda, N.Y. |
| 56289 | Sprague Electric Co. | North Adams, Mass. |
| 59446 | Telex, Inc. | St. Paul, Minn. |
| 61775 | Union Switch and Signal, Div. of Westinghouse Air Brake Co. | Swissvale, Pa. |
| 62119 | Universal Electric Co. | Owosso, Mich. |
| 64959 | Western Electric Co., Inc. | New York, N.Y. |
| 65092 | Weston Inst. Div. of Daystrom, Inc. | Newark, N.J. |
| 66346 | Wollensak Optical Co. | Rochester, N.Y. |
| 70276 | Allen Mfg. Co. | Hartford, Conn. |
| 70309 | Allied Control Co., Inc. | New York, N.Y. |
| 70485 | Atlantic India Rubber Works, Inc. | Chicago, Ill. |
| 70563 | Amperite Co., Inc. | New York, N.Y. |
| 70903 | Belden Mfg. Co. | Chicago, Ill. |
| 70998 | Bird Electronic Corp. | Cleveland, Ohio |
| 71002 | Birnbach Radio Co. | New York, N.Y. |
| 71041 | Boston Gear Works Div. of Murray Co. of Texas | Quincy, Mass. |
| 71218 | Bud Radio Inc. | Cleveland, Ohio |
| 71286 | Camloc Fastener Corp. | Paramus, N.J. |
| 71313 | Allen D. Cardwell Electronic Prod. Corp. | Plainville, Conn. |
| 71400 | Bussmann Fuse Div. of McGraw-Edison Co. | St. Louis, Mo. |
| 71450 | CTS Corp. | Elkhart, Ind. |
| 71468 | Cannon Electric Co. | Los Angeles, Calif. |
| 71471 | Cinema Engineering Co. | Burbank, Calif. |
| 71482 | C. P. Clare & Co. | Chicago, Ill. |
| 71528 | Standard-Thomson Corp., Clifford Mfg. Co. Div. | Waltham, Mass. |
| 71590 | Centralab Div. of Globe Union Inc. | Milwaukee, Wis. |
| 71700 | The Cornish Wire Co. | New York, N.Y. |
| 71744 | Chicago Miniature Lamp Works | Chicago, Ill. |
| 71753 | A. O. Smith Corp., Crowley Div. | West Orange, N.J. |
| 71785 | Cinch Mfg. Corp. | Chicago, Ill. |
| 71984 | Dow Corning Corp. | Midland, Mich. |
| 72136 | Electro Motive Mfg. Co., Inc. | Willimantic, Conn. |
| 72354 | John E. Fast & Co. | Chicago, Ill. |
| 72619 | Dialight Corp. | Brooklyn, N.Y. |
| 72656 | General Ceramics Corp. | Keasbey, N.J. |
| 72758 | Girard-Hopkins | Oakland, Calif. |
| 72765 | Drake Mfg. Co. | Chicago, Ill. |
| 72825 | Hugh H. Eby Inc. | Philadelphia, Pa. |
| 72928 | Gudeman Co. | Chicago, Ill. |
| 72982 | Erie Resistor Corp. | Erie, Pa. |
| 73061 | Hansen Mfg. Co., Inc. | Princeton, Ind. |
| 73138 | Helipot Div. of Beckman Instruments, Inc. | Fullerton, Calif. |
| 73293 | Hughes Products Division of Hughes Aircraft Co. | Newport Beach, Calif. |
| 73445 | Amperex Electronic Co., Div. of North American Phillips Co., Inc. | Hicksville, N.Y. |
| 73506 | Bradley Semiconductor Corp. | Hamden, Conn. |
| 73559 | Carling Electric, Inc. | Hartford, Conn. |
| 73682 | George K. Garrett Co., Inc. | Philadelphia, Pa. |
| 73734 | Federal Screw Products Co. | Chicago, Ill. |
| 73743 | Fischer Special Mfg. Co. | Cincinnati, Ohio |
| 73793 | The General Industries Co. | Elyria, Ohio |

From: F.S.C. Handbook Supplements
H4-1 Dated February 1962
H4-2 Dated January 1962

# APPENDIX
## CODE LIST OF MANUFACTURERS (Sheet 2 of 2)

| CODE NO. | MANUFACTURER | ADDRESS |
|---|---|---|
| 73905 | Jennings Radio Mfg. Co. | San Jose, Calif. |
| 74455 | J. H. Winns, and Sons | Winchester, Mass. |
| 74861 | Industrial Condenser Corp. | Chicago, Ill. |
| 74868 | R.F. Products Division of Amphenol-Borg Electronics Corp. | Danbury, Conn. |
| 74970 | E. F. Johnson Co. | Waseca, Minn. |
| 75042 | International Resistance Co. | Philadelphia, Pa. |
| 75173 | Jones, Howard B., Division of Cinch Mfg. Corp. | Chicago, Ill. |
| 75378 | James Knights Co. | Sandwich, Ill. |
| 75382 | Kulka Electric Corporation | Mt. Vernon, N.Y. |
| 75818 | Lenz Electric Mfg. Co. | Chicago, Ill. |
| 75915 | Littelfuse Inc. | Des Plaines, Ill. |
| 76005 | Lord Mfg. Co. | Erie, Pa. |
| 76210 | C. W. Marwedel | San Francisco, Calif. |
| 76433 | Micamold Electronic Mfg. Corp. | Brooklyn, N.Y. |
| 76487 | James Millen Mfg. Co., Inc. | Malden, Mass. |
| 76493 | J. W. Miller Co. | Los Angeles, Calif. |
| 76530 | Monadnock Mills | San Leandro, Calif. |
| 76545 | Mueller Electric Co. | Cleveland, Ohio |
| 76854 | Oak Manufacturing Co. | Crystal Lake, Ill. |
| 77068 | Bendix Pacific Division of Bendix Corp. | No. Hollywood, Calif. |
| 77221 | Phaostron Instrument and Electronic Co. | South Pasadena, Calif. |
| 77252 | Philadelphia Steel and Wire Corp. | Philadelphia, Pa. |
| 77342 | Potter and Brumfield, Div. of American Machine and Foundry | Princeton, Ind. |
| 77630 | Radio Condenser Co. | Camden, N.J. |
| 77638 | Radio Receptor Co., Inc. | Brooklyn, N.Y. |
| 77764 | Resistance Products Co. | Harrisburg, Pa. |
| 78189 | Shakeproof Division of Illinois Tool Works | Elgin, Ill. |
| 78283 | Signal Indicator Corp. | New York, N.Y. |
| 78471 | Tilley Mfg. Co. | San Francisco, Calif. |
| 78488 | Stackpole Carbon Co. | St. Marys, Pa. |
| 78553 | Tinnerman Products, Inc. | Cleveland, Ohio |
| 78790 | Transformer Engineers | Pasadena, Calif. |
| 78947 | Ucinite Co. | Newtonville, Mass. |
| 79142 | Veeder Root, Inc. | Hartford, Conn. |
| 79251 | Wenco Mfg. Co. | Chicago, Ill. |
| 79727 | Continental-Wirt Electronics Corp. | Philadelphia, Pa. |
| 79963 | Zierick Mfg. Corp. | New Rochelle, N.Y. |
| 80031 | Mepco Division of Sessions Clock Co. | Morristown, N.J. |
| 80120 | Schnitzer Alloy Products | Elizabeth, N.J. |
| 80130 | Times Facsimile Corp. | New York, N.Y. |
| 80131 | Electronic Industries Association Any brand tube meeting EIA standards | Washington, D.C. |
| 80207 | Unimax Switch, Div. of W. L. Maxson Corp. | Wallingford, Conn. |
| 80248 | Oxford Electric Corp. | Chicago, Ill. |
| 80294 | Bourns Laboratories, Inc. | Riverside, Calif. |
| 80411 | Acro Div. of Robertshaw Fulton Controls Co. | Columbus 16, Ohio |
| 80486 | All Star Products Inc. | Defiance, Ohio |
| 80583 | Hammerlund Co., Inc. | New York, N.Y. |
| 80640 | Stevens, Arnold, Co., Inc. | Boston, Mass. |
| 81030 | International Instruments, Inc. | New Haven, Conn. |
| 81312 | Winchester Electronics Co., Inc. | Norwalk, Conn. |
| 81415 | Wilkor Products, Inc. | Cleveland, Ohio |
| 81453 | Raytheon Mfg. Co., Industrial Components Div., Industr. Tube Operations | Newton, Mass. |
| 81483 | International Rectifier Corp. | El Segundo, Calif. |
| 81860 | Barry Controls, Inc. | Watertown, Mass. |
| 82042 | Carter Parts Co. | Skokie, Ill. |
| 82142 | Jeffers Electronics Division of Speer Carbon Co. | Du Bois, Pa. |
| 82170 | Allen B. DuMont Labs., Inc. | Clifton, N.J. |
| 82209 | Maguire Industries, Inc. | Greenwich, Conn. |
| 82219 | Sylvania Electric Prod. Inc., Electronic Tube Div. | Emporium, Pa. |
| 82376 | Astron Co. | East Newark, N.J. |
| 82389 | Switchcraft, Inc. | Chicago, Ill. |
| 82647 | Metals and Controls, Inc., Div. of Texas Instruments, Inc., Spencer Prods. | Attleboro, Mass. |
| 82866 | Research Products Corp. | Madison, Wis. |
| 82877 | Rotron Manufacturing Co., Inc. | Woodstock, N.Y. |
| 82893 | Vector Electronic Co. | Glendale, Calif. |
| 83053 | Western Washer Mfr. Co. | Los Angeles, Calif. |
| 83058 | Carr Fastener Co. | Cambridge, Mass. |
| 83086 | New Hampshire Ball Bearing, Inc. | Peterborough, N.H. |
| 83125 | Pyramid Electric Co. | Darlington, S.C. |
| 83148 | Electro Cords Co. | Los Angeles, Calif. |
| 83186 | Victory Engineering Corp. | Union, N.J. |
| 83298 | Bendix Corp., Red Bank Div. | Red Bank, N.J. |
| 83330 | Smith, Herman H., Inc. | Brooklyn, N.Y. |
| 83501 | Gavitt Wire and Cable Co., Div. of Amerace Corp. | Brookfield, Mass. |
| 83594 | Burroughs Corp., Electronic Tube Div. | Plainfield, N.J. |
| 83777 | Model Eng. and Mfg., Inc. | Huntington, Ind. |
| 83821 | Loyd Scruggs Co. | Festus, Mo. |
| 84171 | Arco Electronics, Inc. | New York, N.Y. |
| 84396 | A. J. Glesener Co., Inc. | San Francisco, Calif. |
| 84411 | Good All Electric Mfg. Co. | Ogallala, Neb. |
| 84970 | Sarkes Tarzian, Inc. | Bloomington, Ind. |
| 85454 | Boonton Molding Company | Boonton, N.J. |
| 85474 | R. M. Bracamonte & Co. | San Francisco, Calif. |
| 85660 | Koiled Kords, Inc. | New Haven, Conn. |
| 85911 | Seamless Rubber Co. | Chicago, Ill. |
| 86197 | Clifton Precision Products | Clifton Heights, Pa. |
| 86684 | Radio Corp. of America, RCA Electron Tube Div. | Harrison, N.J. |
| 87216 | Philco Corp. (Lansdale Division) | Lansdale, Pa. |
| 87473 | Western Fibrous Glass Products Co. | San Francisco, Calif. |
| 88140 | Cutler-Hammer, Inc. | Lincoln, Ill. |
| 88220 | Gould-National Batteries, Inc. | St. Paul, Minn. |
| 89473 | General Electric Distributing Corp. | Schenectady, N.Y. |
| 89636 | Carter Parts Div. of Economy Baler Co. | Chicago, Ill. |
| 89665 | United Transformer Co. | Chicago, Ill. |
| 90179 | U.S. Rubber Co., Mechanical Goods Div. | Passaic, N.J. |
| 90970 | Bearing Engineering Co. | San Francisco, Calif. |
| 91260 | Connor Spring Mfg. Co. | San Francisco, Calif. |
| 91418 | Radio Materials Co. | Chicago, Ill. |
| 91506 | Augat Brothers,'Inc. | Attleboro, Mass. |
| 91637 | Dale Electronics, Inc. | Columbus, Nebr. |
| 91662 | Elco Corp. | Philadelphia, Pa. |
| 91737 | Gremar Mfg. Co., Inc. | Wakefield, Mass. |
| 91827 | K F Development Co. | Redwood City, Calif. |
| 91921 | Minneapolis-Honeywell Regulator Co., Micro-Switch Division | Freeport, Ill. |
| 92196 | Universal Metal Products, Inc. | Bassett Puente, Calif. |
| 93332 | Sylvania Electric Prod. Inc., Semiconductor Div. | Woburn, Mass. |
| 93369 | Robbins and Myers, Inc. | New York, N.Y. |
| 93410 | Stevens Mfg. Co., Inc. | Mansfield, Ohio |
| 93983 | Insuline-Van Norman Ind., Inc. Electronic Division | Manchester, N.H. |
| 94144 | Raytheon Mfg. Co., Industrial Components Div., Receiving Tube Operation | Quincy, Mass. |
| 94145 | Raytheon Mfg. Co., Semiconductor Div., California Street Plant | Newton, Mass. |
| 94148 | Scientific Radio Products, Inc., | Loveland, Colo. |
| 94154 | Tung-Sol Electric, Inc. | Newark, N.J. |
| 94197 | Curtiss-Wright Corp., Electronics Div. | East Paterson, N.J. |
| 94310 | Tru Ohm Prod. Div. of Model Engineering and Mfg. Co. | Chicago, Ill. |
| 94682 | Worcester Pressed Aluminum Corp. | Worcester, Mass. |
| 95236 | Allies Products Corp. | Miami, Fla. |
| 95238 | Continental Connector Corp. | Woodside, N.Y. |
| 95263 | Leecraft Mfg. Co., Inc. | New York, N.Y. |
| 95264 | Lerco Electronics, Inc. | Burbank, Calif. |
| 95265 | National Coil Co. | Sheridan, Wyo. |
| 95275 | Vitramon, Inc. | Bridgeport, Conn. |
| 95354 | Methode Mfg. Co. | Chicago, Ill. |
| 95987 | Weckesser Co. | Chicago, Ill. |
| 96067 | Huggins Laboratories | Sunnyvale, Calif. |
| 96095 | Hi-Q Division of Aerovox | Olean, N.Y. |
| 96256 | Thordarson-Meissner Div. of Maguire Industries, Inc. | Mt. Carmel, Ill. |
| 96296 | Solar Manufacturing Co. | Los Angeles, Calif. |
| 96330 | Carlton Screw Co. | Chicago, Ill. |
| 96341 | Microwave Associates, Inc. | Burlington, Mass. |
| 96501 | Excel Transformer Co. | Oakland, Calif. |
| 97464 | Industrial Retaining Ring Co. | Irvington, N.J. |
| 97539 | Automatic and Precision Mfg. Co. | Yonkers, N.Y. |
| 97966 | CBS Electronics, Div. of C.B.S., Inc. | Danvers, Mass. |
| 98141 | Axel Brothers Inc. | Jamaica, N.Y. |
| 98220 | Francis L. Mosley | Pasadena, Calif. |
| 98278 | Microdot, Inc. | So. Pasadena, Calif. |
| 98291 | Sealectro Corp. | Mamaroneck, N.Y. |
| 98405 | Carad Corp. | Redwood City, Calif. |
| 98734 | Palo Alto Engineering Co., Inc. | Palo Alto, Calif. |
| 98821 | North Hills Electric Co. | Mineola, N.Y. |
| 98925 | Clevite Transistor Prod. Div. of Clevite Corp. | Waltham, Mass. |
| 98978 | International Electronic Research Corp. | Burbank, Calif. |
| 99109 | Columbia Technical Corp. | New York, N.Y. |
| 99313 | Varian Associates | Palo Alto, Calif. |
| 99515 | Marshall Industries, Electron Products Division | Pasadena, Calif. |
| 99707 | Control Switch Division, Controls Co. of America | El Segundo, Calif. |
| 99800 | Delevan Electronics Corp. | East Aurora, N.Y. |
| 99848 | Wilco Corporation | Indianapolis, Ind. |
| 99934 | Renbrandt, Inc. | Boston, Mass. |
| 99942 | Hoffman Semiconductor Div. of Hoffman Electronics Corp. | Evanston, Ill. |
| 99957 | Technology Instrument Corp. of Calif. | Newbury Park, Calif. |

THE FOLLOWING H-P VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.

| | | |
|---|---|---|
| 0000F | Malco Tool and Die | Los Angeles, Calif. |
| 0000I | Telefunken (c/o American Elite) | New York, N.Y. |
| 0000M | Western Coil Div. of Automatic Ind., Inc. | Redwood City, Calif. |
| 0000N | Nahm-Bros. Spring Co. | San Leandro, Calif. |
| 0000P | Ty-Car Mfg. Co., Inc. | Holliston, Mass. |
| 0000T | Texas Instruments, Inc. Metals and Controls Div. | Versailles, Ky. |
| 0000U | Tower Mfg. Corp. | Providence, R.I. |
| 0000W | Webster Electronics Co. Inc. | New York, N.Y. |
| 0000X | Spruce Pine Mica Co. | Spruce Pine, N.C. |
| 0000Y | Midland Mfg. Co. Inc. | Kansas City, Kans. |
| 0000Z | Willow Leather Products Corp. | Newark, N.J. |
| 000AA | British Radio Electronics Ltd. | Washington, D.C. |
| 000BB | Precision Instrument Components Co. | Van Nuys, Calif. |
| 000CC | Computer Diode Corp. | Lodi, N.J. |
| 000EE | A. Williams Manufacturing Co. | San Jose, Calif. |
| 000FF | Carmichael Corrugated Specialties | Richmond, Calif. |
| 000GG | Goshen Die Cutting Service | Goshen, Ind. |
| 000HH | Rubbercraft Corp. | Torrance, Calif. |
| 000II | Birtcher Corporation, Industrial Division | Monterey Park, Calif. |
| 000KK | Amatom | New Rochelle, N.Y. |
| 000LL | Avery Label | Monrovia, Calif. |
| 000MM | Rubber Eng. & Development | Hayward, Calif. |

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# WARRANTY CLAIM AND ADJUSTMENT PROCEDURE

for microwave tubes supplied by the
HEWLETT-PACKARD COMPANY
for use in Hewlett-Packard instruments

The procedure described below is for use within the United States. For warranty claims arising outside the U.S.A., before returning the tube, fill out the form on the reverse side and send it with a request for shipping instructions to your nearest Hewlett-Packard Sales and Service Office or to:

(in Western Europe)

Hewlett-Packard S.A.
1217 Meyrin
Geneva, Switzerland
Telephone: (022) 41 54 00
Telex: 2.24.86
Cable: HEWPACKSA

(Rest of World)

Hewlett-Packard Co.
International Marketing Dept.
1501 Page Mill Road
Palo Alto, California, 94304, U.S.A.
Telephone: (415) 326-7000
Telex: 033811
Cable: HEWPACK

Microwave tubes supplied by the Hewlett-Packard Company, either as original or replacement, for use in Hewlett-Packard instruments are actually warranted by the tube manufacturer and not by Hewlett-Packard. However, all warranty claims on tubes obtained from us either as original or replacement will be processed by Hewlett-Packard.

In the event of failure you should purchase a new tube and return your old tube immediately to Hewlett-Packard. Credit allowances will be passed on to you upon receipt of the defective tube.

For your convenience, warranty claims for all microwave tubes supplied by the Hewlett-Packard Company may be made on this single form; merely fill out the information on the reverse side and return this form, along with the defective tube, to your Hewlett-Packard Sales and Service Office or to Hewlett-Packard. Please be sure each space on the form is filled in--lack of complete information may delay processing of your claim.

Each tube manufacturer has his own warranty policy. Copies of individual Conditions of Warranty are available from your Hewlett-Packard Sales and Service Office or from the Hewlett-Packard Company.

## SHIPPING INSTRUCTIONS

The following instructions are included to aid you in preventing damage in transit. Package your tube carefully--no allowance can be made on broken tubes.

1. Carefully wrap tube in 1/4-inch thick cellulosic cushioning, cotton batting, or other soft padding material. Cable assemblies and other accessories not rigidly mounted to the tube should be padded and wrapped separately to prevent damage to the tube during shipment.
2. Wrap the above in heavy kraft paper.
3. Pack in a rigid container which is at least 4 inches larger than the tube in each dimension.
4. Surround the tube with at least 2 inches of shock absorbing material. Be certain that the packing is tight all around the tube.
5. Tubes returned from outside the continental United States should be packed in a wooden box.
6. Mark container FRAGILE and ship prepaid via Air freight or Railway Express. Do not ship via Parcel Post or Air Parcel Post since experience has shown that fragile items are more apt to be damaged when shipped by these means.

Note

Tubes with permanent magnets can interfere with magnetic compasses.
For air shipment plainly mark container: "MAGNETIZED MATERIAL"

In warranty tubes purchased from Hewlett-Packard may be returned, with a completed warranty Claim Form, to your local Hewlett-Packard Sales and Service Office, or to:

Hewlett-Packard Company
Customer Service Center
333 Logue Avenue
Mountain View, California 94040
USA

Rev 12/16/69

# MICROWAVE TUBE WARRANTY CLAIM INFORMATION FORM

IMPORTANT: Please answer all questions fully -- insufficient information may delay processing of your claim.

DATE: _____

FROM: (Tube Owner)

Company _____

Address _____

_____

_____

Tube type _____

Tube serial No. _____

Tube mfr. _____

Use in HP Model _____

Instrument serial No. _____

Tube is Original ( ) or Replacement ( )

Date tube received _____

Date of failure _____

Total hours filament operation _____

SYMPTOMS: (Please describe conditions prior to and at time of failure, along with description of tube's defect, if known) _____

_____

_____

_____

IMPORTANT:
Replacement (new) tube serial No. _____

Signature _____

Title _____

For HP use only
Repair order # _____

12/16/69

# BACKDATING APPENDIX
# MODEL 626A

| Serial Prefix | Make Changes |
|---|---|
| Serials 176 & below | A thru Q |
| Serials 201 & below | B thru Q |
| Serials 261 & below | C thru Q |
| 003- | D thru Q |

| Serial Prefix | Make Changes |
|---|---|
| 019- | E thru Q |
| 134- | F thru Q |
| 229- | G thru Q |
| 250- | H thru Q |

| Serial Prefix | Make Changes |
|---|---|
| 609- | I thru Q |
| 651- | J thru Q |
| 651-01561 to 651-01400 | K thru Q |
| 651-01401 to 651-01460 | L thru Q |

| Serial Prefix | Make Changes |
|---|---|
| 976-01461 to 976-01470 | M thru Q |
| 976-01471 to 976-01480 | N thru Q |
| 976-01481 to 976-01520 | O, P, Q |
| 1101A | P,Q |
| 1202A | Q |

CHANGE A

Change paragraph 2-2, page 2-1, to read as follows:

Normally, the Model 626A is shipped from the factory with the power transformers (T1 and T2) wired for 115V 50/60 cycle power line operation. The instrument may be easily converted, however, to operate from a 230V 50/60 cycle power line source by changing the wiring of the primary windings from a parallel to a series arrangement, as shown in the schematic. The conversion procedure is as follows:

1. On T1 and T2, remove the bare wire jumpers between terminals 2A and 5A, and terminals 1A and 4A.

2. Connect new jumpers between terminals 4A and 5A, on T1 and T2.

3. Replace the 2.5-ampere Slo-Blo line fuse for use with 115-volt power with a 1.25-ampere Slo-Blo fuse.

Change R74 from 18,000 ohms to: resistor, fixed, composition, 12,000 ohms, ±10%, 2 W; -hp- Stock No. 25-23K; Mfr., B, HB 1231.

Change R74 on the schematic to read 12K.

CHANGE B

Page 2 make the following changes:

V17 heater wire to FL3 should be yellow
V17 heater-cathode wire to FL4 should be white

Change Modulator and RF Generator Schematic as follows:

Voltage on P7 pin 3 should be -650V

Add the following information on page 4-11 in paragraph 4-9:

-CAUTION-

Before removing the klystron, of the klystron cavity and frequency drive mechanism, you must withdraw the PWR. SET attenuator from the klystron cavity. Failure to do this will result in a broken power set attenuator. The following steps should be followed to protect the power set attenuator when changing the klystron:

CHANGE B Continued

1. Rotate the PWR. SET control maximum clockwise.

2. In Figure 4-8, locate the POWER SET ATTEN. DRIVE in the upper left hand corner of the picture. Loosen the Allen set screws that hold the large gear in the attenuator drive.

3. Locate the collar on the attenuator drive shaft (parallel with the panel) and gently pull this collar away from the large attenuator drive gear until it stops. The power set attenuator card will now be clear of the klystron cavity and you may proceed with the klystron removal.

4. After the klystron assembly has been installed, slide the attenuator shaft back toward the large drive gear making sure the set screw on the collar is on top.

5. With the PWR. SET knob maximum clockwise, press the large gear and collar together with your fingers and tighten the set screws on the gear.

6. Check the operation of the PWR. SET control to make sure it operates smoothly.

CHANGE C

Parts List:

Change S1 to switch, toggle HP 310-11.
Change R117 to resistor, fixed 750K ±1%, HP 33-750K.
Change R118 to resistor, fixed 284K ±1%, HP 33-284K.
Change R121 to resistor, fixed 900K, ±1%, HP 31-900K.
Change R122 to resistor, fixed 405K, ±1%, HP 33-450K.
Under miscellaneous change fuseholder to HP 140-16.

CHANGE D

Parts List:

Delete CR2 through CR15.
Delete C46 A/B and C47A/B.
Delete R142.
Delete R132 through R239.
Delete R140 and R141.
Delete RT1, ballast tube.
Change T1 to HP 910-141.
Change T2 to HP 910-140.
Add C2, C3, C13 and C14; capacitor fixed electrolytic, 45 μf., 450 v.d.c.w.
Add SR1 and SR2; Rectifier, metallic HP 212-110.
Add SR3; Rectifier, metallic HP 212-111.
Add SR4; Rectifier, metallic HP 212-111.
Add SR5; Rectifier, metallic HP 212-113.

CHANGE E

Parts List:

Delete C48.
Change R115 to HP 210-211.
Miscellaneous: Mechanical modification in the RF Output connector changes the appearance of the front pannel from that shown in the manual. The plastic cover is replaced by a metal captive cap for the flange.

CHANGE F

Figure 5-18:

Change connection on T1 from C3 to C2.

Figure 5-18 and Parts List:

Change R15 to HP 0730-0100, 800K ohms, ±1%, 1W.
Change R30 to HP 0727-0244, 516K ohms, ±1%, 1/2W.

Figure 5-20 and Parts List:

Change R41 to HP 0773-0009, 66K ohms, ±5%, 5W.
Change R52 and R53 to HP 0730-0079, 216.3K ohms, ±1%, 1W.
Change R64 to HP 0773-0009 66K ohms, ±5%, 5W.
Change R65 to HP 0690-4751, 4.7 Megohm.
Change R79 to HP 0687-4741, 33K ohms, ±10%, 1/2 W.

Figure 5-22 and Parts List:

Delete R91

Parts List:

Change L3 and L6 to 200μH, same part number.
Change RT123 to HP 0839-0005 thermistor, WE 170575.

Table 6-2:

Delete reference to HP Part No. 626A-38B.
Add Screwdriver, HP Part No. 626A-38B-1, and Wrench Assembly Tube, HP Part No. 626A-38B-2.
Change HP Part No. 626A-650D to 626A-65A.
Change HP Part No. 626A-65E to 626A-65B.
Change HP Part No. 626A-65F to 626A-65C.

CHANGE G

Figure 5-22 and Parts List:

Change C40 to HP 0150-0012, 0.01μf ±20% 1000 v.d.c.w.

CHANGE H

Table 1-1, Under "Output Range".

Change to read, "- - - SWR less than 2.5 at +10dBm; 1.2 at 0dBm and lower".

CHANGE I

Figure 5-20 and Parts List:

Delete the asterisk (*) adjacent to R41. This was not a factory selected value.

CHANGE J

Parts List:

Change B1 fan motor to HP 3140-0010.

CHANGE K

Figure 5-18 and Parts List:

Change R131 * to HP 0693-6801, 68* ohms, ±10%, 2W.

CHANGE L

Page 2-1, paragraph 2-11:

Delete paragraph 2-12 and replace with the following:

2-12. To operate the Model 626A from a 230-volt ±10% source, change the primary windings of T1 and T2 from a parallel to a series arrangement. Refer to the schematic diagram and proceed as follows:

a. Remove the two bare wire jumpers from the terminals on T1 and T2. These jumpers connect terminal A1 to A4 and A2 to A5 on the primary winding.

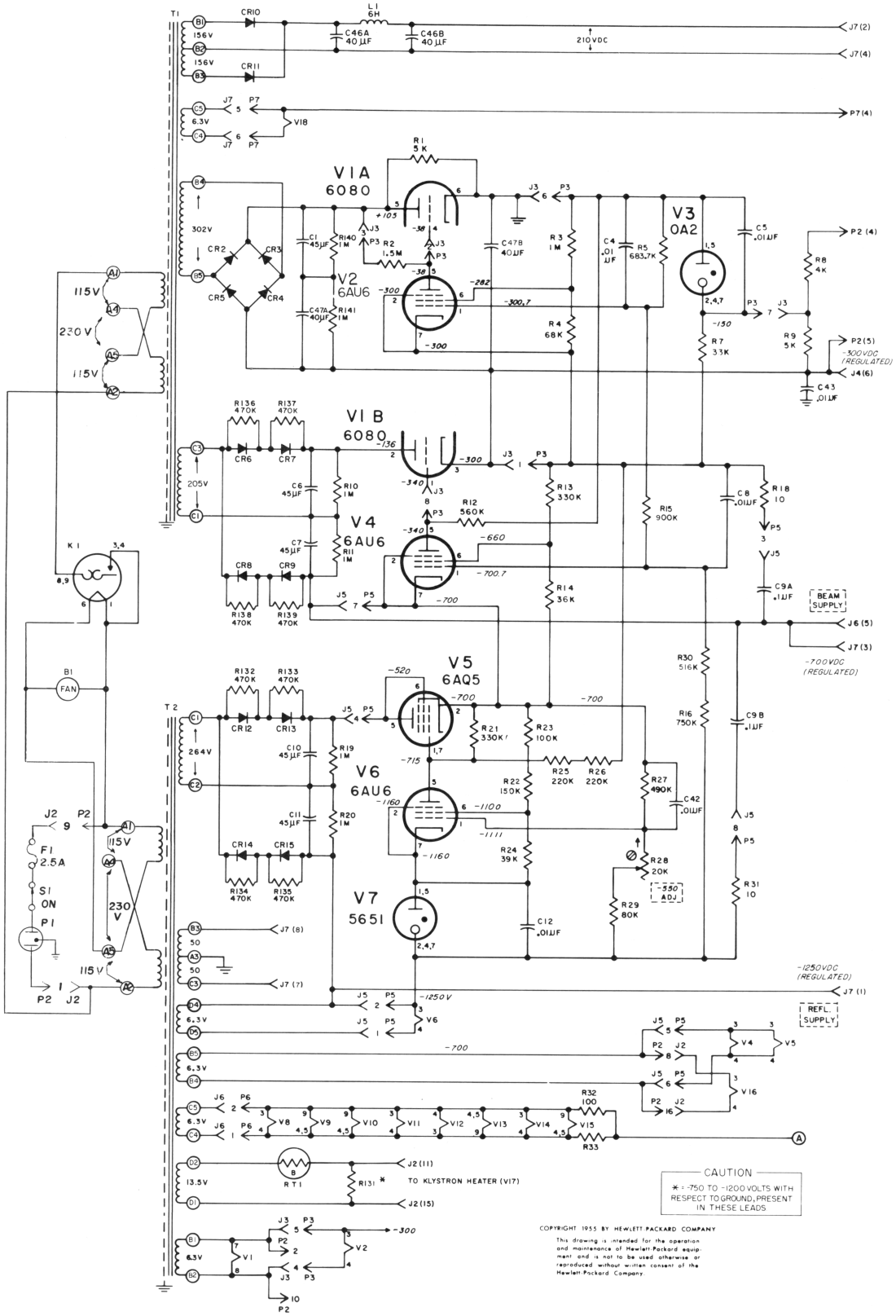
b. Connect a new jumper between terminal A4 and A5.

c. Change the line fuse to a 1.25 amp slow-blow.

CHANGE L Continued

Page 5-23, Figure 5-18:

Replace existing figure 5-18 with figure 5-18 below:

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CHANGE L Continued

Parts List:

Delete DS1, glow lamp, HP Part No. 2140-0244.
Add I1, Lamp, incd: 6-8v. type 47, HP 2140-0009.
Delete J1 connector: AC receptacle, 3 pin male, HP Part No. 1251-2357.
Delete R142, R: Fxd, met. flm., 34.8K ohm, 1%, 1/2W, HP Part No. 9757-0123.
Delete S5, switch: slide 4PDT, HP Part No. 3101-1272.
Change P1, Power Cable to HP 8120-0015. The power cord is not detachable.
Change S1, Pushbutton switch to HP 3101-0030. Switch, toggle SPST

CHANGE M

Page 6-8, Table 6-1:

Change V11 HP Stock No. and Description to 1941-0003 Tube, electron: 5696.

Page 6-7, Table 6-1:

Delete R126, R127, the HP Stock No. and Description.

Page 6-5, Table 6-1:

Change R54 HP Stock No. and Description to 0687-4731 R: Fxd. comp. 47K ohm 10%, 1/2W.

Page 6-2, Table 6-1:

Change C26 and C30 HP Stock No. and Description to 0140-0003 C: Fxd. mica 1000pf ±10%, 500 udc W.

Page 5-25, Figure 5-20:

Change V11 description to 5696.
Delete R126, R127.
Change R54 description to 47K.
Change C26 and C30 description to 1000pf.

CHANGE N

Page 6-8, Table 6-1:

Change V14 HP Stock No. and Description to 1941-0003 tube, electron: 5696.

Page 6-7, Table 6-1:

Add R126, 127 0687-3951 R: Fxd., comp. 3.9M ±10%, 1/2W.

Page 6-5, Table 6-1:

Change R54 HP Stock No. and Description to 0687-1051 R: Fxd., comp. 1 MEG ohm, 10%, 1/2W.

Page 6-5, Table 6-1:

Add R59 & R67 HP Stock No. and Description 0687-1041 R: Fxd. comp. 100K ohm 10%, 1/2W.

Page 5-25, Figure 5-20:

Change V14 description to 5696.
Show R127 3.9M resistor connected between V14 pins 5,7 and the junction of R63 and C48.
Show R126 3.9M resistor connected between V11 pin 5,7 and the junction of R57 and R60.
Change R54 description to 1M.
Show R59 100K resistor connected between the -300V buss line and V11 pins 5,7.
Show R67 100K resistor connected between the -300V buss line and V14 pins 5,7.
Show no connection from V14 pin 2 and pin 5,7
Show no connection from V11 pin 2 and pin 5,7

CHANGE O

Change all references in manual, pertaining to Sync Out Pulse Delay, from "5 to 300 microseconds" to "3 to 300 microseconds".
Table 1-1, Sync Out Signal, change to read, "- - - variable 3 to 300 microseconds".

CHANGE P

Parts List and Illustrated Parts Identification:

These instruments manufactured with Blue-Gray Panel and Cabinet parts only.

CHANGE Q

Parts List :

Change C35 from HP 0160-3192, 0.1μf. 1200v., to HP 0160-0050, 0.1μf., 400v.

# ILLUSTRATED PARTS IDENTIFICATION

# MODEL 626A

# SUPER HIGH FREQUENCY SIGNAL GENERATOR

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1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

PRINTED: JAN 1965

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | | See Figures 8 and 9 | |
| 2 | | See Figure 5 | |
| 3 | | See Figure 8 | |
| 4 | | See Figure 8 | |
| 5 | | See Figure 4 | |
| 6 | | See Figure 6 | |
| 7 | | See Figures 2 and 3 | |
| 8 | | See Figure 7 | |
| 9 | | See Figure 10 | |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|

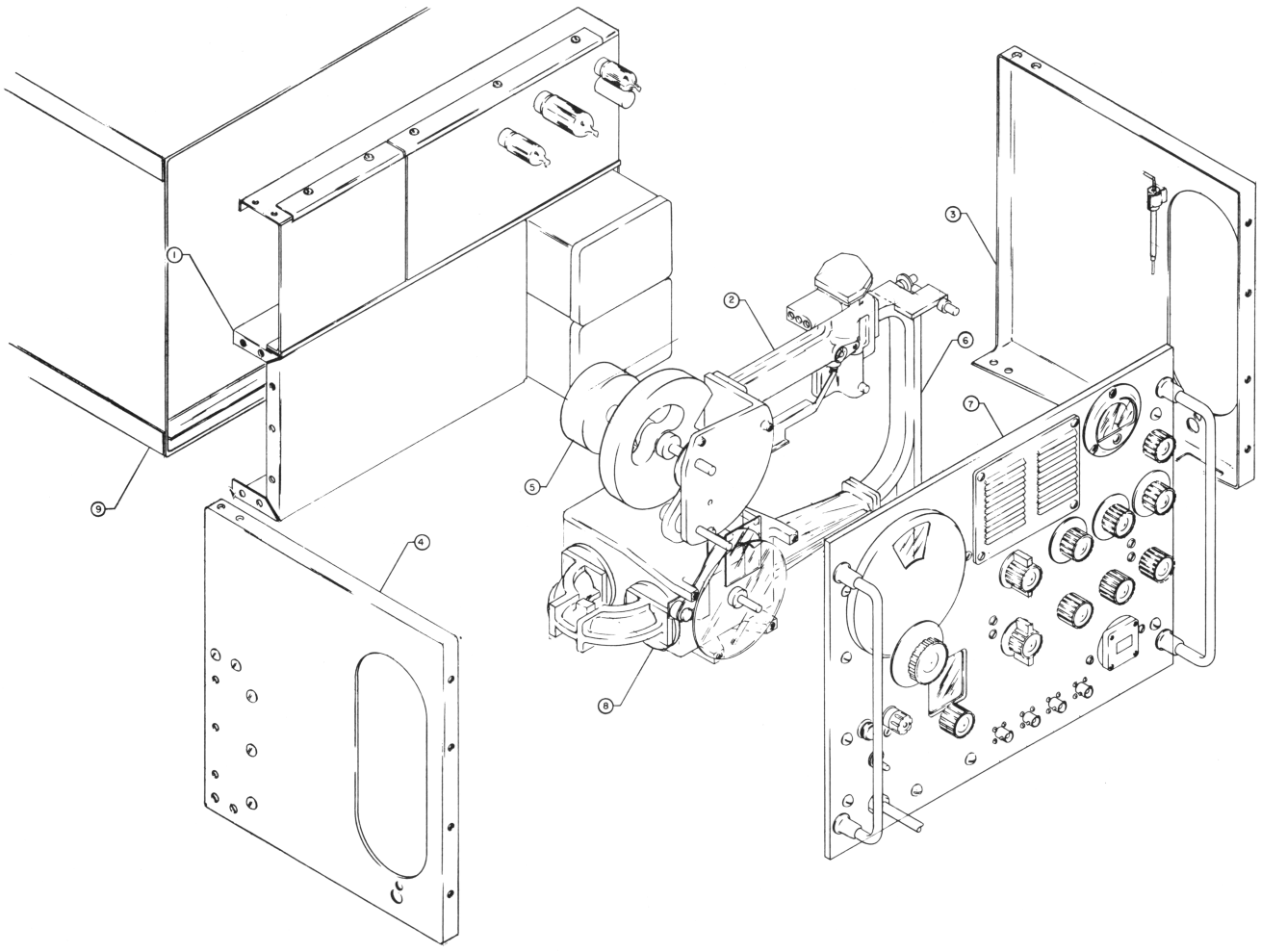


Figure 1. -hp- Model 626A, S.H.F. Signal Generator, General Arrangement

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 628A-2 | Panel: Cabinet Model | 1 |
| 2 | 2190-0034 | Washer: Split lock for #10 screw | 4 |
| 3 | 2990-0002 | Screw: Truss head ss 10-24 thd 3/8 in. lg | 19 |
| 4 | 2950-0038 | Nut: 11/16 in. wide 1/2-24 thd | 1 |
| 5 | 2190-0037 | Washer: Int. lock 0.78 o.d. | 1 |
| 6 | 3101-0030 | Switch: Toggle s.p.s.t. | 1 |
| 7 | 2950-0035 | Nut: 9/16 in. wide 15/32-thd | 1 |
| 8 | 0590-0037 | Nut: 13/16 in. wide 11/16-27 thd | 1 |
| 9 | 2190-0002 | Washer: Int. lock 61/64 in. o.d. | 1 |
| 10 | J382A-17 | Mount: Gear | 1 |
| 11 | 3030-0001 | Screw: Allen dr set 8-32 thd 3/16 in. lg | 26 |
| 12 | 61B-3AT | Ferrule, Panel handle | 4 |
| 13 | 0525-0002 | Screw: Round head ss 3-56 thd 3/8 in. lg | 16 |
| 14 | 0900-0016 | O-Ring: 1/2 in. i.d. 11/16 in. o.d. | 1 |
| 15 | 0590-0012 | Nut: .60 in. dia 15/32-32 thd | 1 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 16 | 2390-0001 | Screw: Bind head ss 6-32 thd 1/2 in. lg | 1 |
| 17 | 3050-0032 | Washer: 3/8 in. o.d. 0.172 in. i.d. | 16 |
| 18 | 5000-0202 | Dial: Blank 1-3/4 in. dia | 3 |
| 19 | 618B-3E | Handle: Panel | 2 |
| 20 | 0400-0004 | Grommet: Nylon | 1 |
| 21 | 8120-0015 | Cable: R.F. R-G. -58U per ft | 1 |
| 22 | 1400-0084 | Fuseholder: Post type 2-5/64 in. lg | 1 |
| 23 | 2110-0015 | Fuse: Cartridge 2.5 amp 125 volt | 1 |
| 24 | 1450-0004 | Light: Red indicator 1/2 in. dia | 1 |
| 25 | 2140-0009 | Lamp: Incandescent clear no. 47 6-8v | 1 |
| 26 | 0370-0029 | Knob: 1 in. dia, blk 1/4 in. shaft with arrow | 3 |
| 27 | 3050-0117 | Washer: 1 in o.d. 5/16 in. i.d. | 1 |
| 28 | 61B-40D-3 | Hub: Frequency dial | 1 |
| 29 | 61B-40D-4 | Plate: Frequency dial | 1 |
| 30 | 2370-0001 | Screw: Flat head ss 6-32 thd 1/4 in. lg | 4 |
| 31 | 620A-40B | Window: Dial | 1 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 32 | 628A-36A-9 | Dial: Frequency | 1 |
| 33 | 2190-0016 | Washer: Int lock 1/2 in. o.d. | 8 |
| 34 | 2950-0001 | Nut: 1/2 in. wide 3/8-32 thd | 8 |
| 35 | 0370-0030 | Knob: 1 in. dia, blk 1/4 in. shaft | 3 |
| 36 | 628A-3C | Bezel: Air filter | 1 |
| 37 | 1120-0037 | Meter: 200$\mu$A dbm | 1 |
| 38 | 2280-0005 | Screw: Round head br 4-40 thd 5/8 in. lg | 3 |
| 39 | 628A-41A | Plate: Panel | 1 |
| 40 | 2470-0001 | Screw: Bind head br 6-32 thd 1/4 in. lg | 4 |
| 41 | 2550-0009 | Screw: Bind head ss 8-32 thd 1/2 in. lg | 6 |
| 42 | 61B-40D-2 | Cover: Freq. dial | 1 |
| 43 | 628A-40A | Dial: Vernier | 1 |
| 44 | 2200-0010 | Screw: Round head ss 4-40 thd 3/4 in. lg. | 4 |
| 45 | 0520-0025 | Screw: Round head 2-56 thd 1/8 in. lg | 3 |
| 46 | 0370-0035 | Knob: 3/4 in. dia, blk 1/4 in. shaft | 2 |
| 47 | 0370-0028 | Knob: 1 in. dia, blk 1/4 in. shaft | 2 |

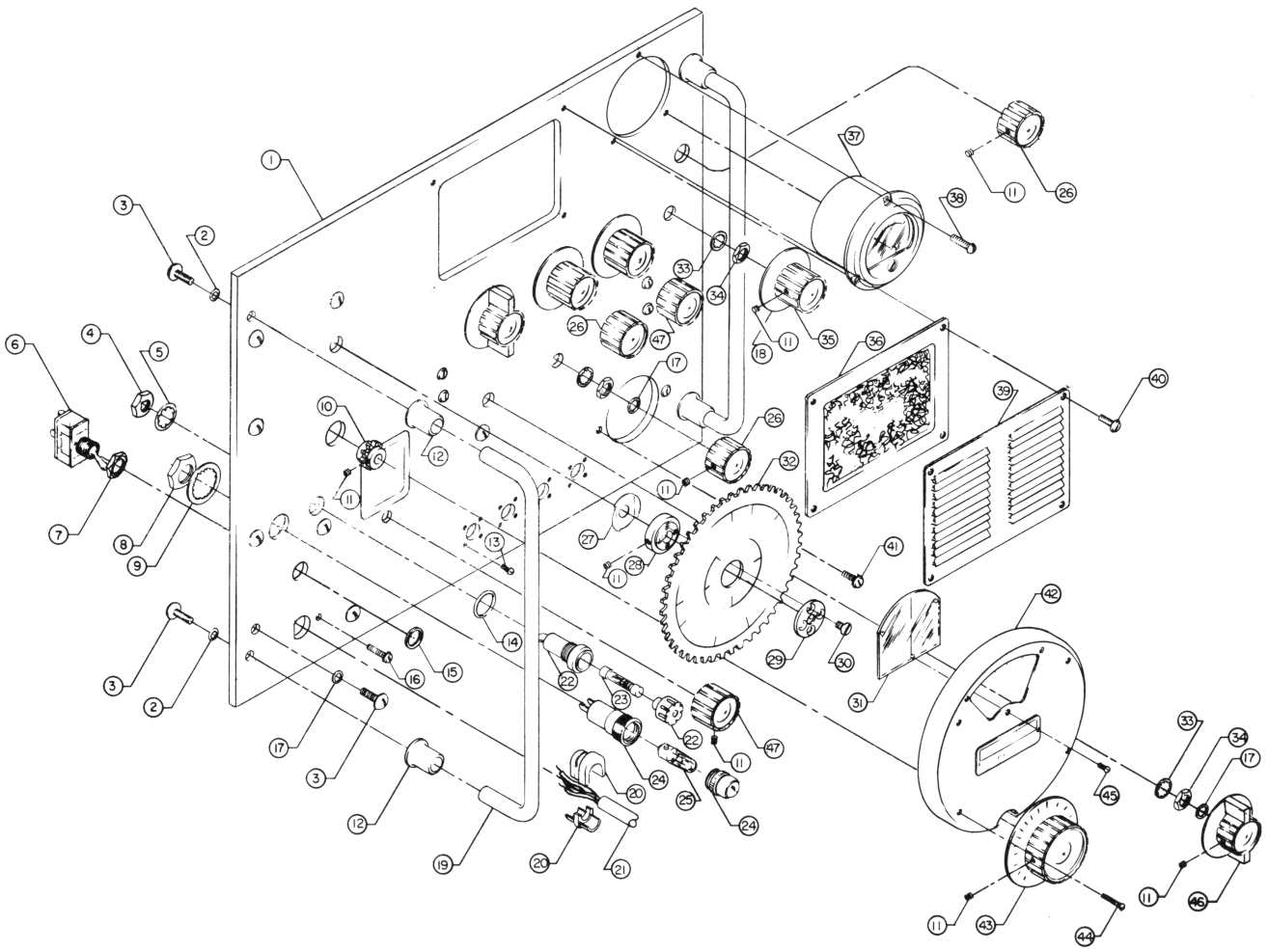

Figure 2. -hp- Model 626A, S.H.F. Signal Generator, Control Panel, Front View

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 00626-60018 | **Panel: Cabinet Model** | 1 |
| | 00626-60019 | **Panel: Rack Model** | |
| 2 | 2190-0016 | Washer: Int. lock 1/2 in. o.d. | 15 |
| 3 | | See Operating and Service Manual | |
| 4 | 1410-0003 | Bushing: Threaded 3/8-32 thd 1/2 in lg | 4 |
| 5 | 5000-0206 | Washer: Spring 9/16 in. dia | 4 |
| 6 | 5020-0233 | Collar: 1/4 in. shaft 1/2 in. dia | 3 |
| 7 | 3030-0001 | Screw: Allen dr set 8-32 thd 3/16 in. lg | 14 |
| 8 | 2360-0002 | Screw: Round head ss 6-32 thd 1/4 in. lg | 1 |
| 9 | 1500-0002 | Yoke: Coupler 1/4 in. i.d. | 6 |
| 10 | 1360-0011 | Strip: 1 Terminal | 1 |
| 11 | 5020-0319 | Shaft: 1/4 in. dia 1-3/16 in. lg | 1 |
| 12 | 2360-0007 | Screw: Phillips ss 6-32 thd 1/2 in. lg | 2 |
| 13 | 628A-41B | Insulator: Modulator | 1 |
| 14 | 2360-0005 | Screw: Round head ss 6-32 thd 3/8 in. lg | 13 |
| 15 | 21900-0007 | Washer: Int. lock for #6 screw | 6 |
| 16 | 2190-0018 | Washer: Split lock for #6 screw | 9 |
| 17 | | See Operating and Service Manual | |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 18 | 1200-0053 | Socket: 7 Pin tube printed circuit mtg | 1 |
| 19 | 1200-0059 | Socket: 9 Pin tube shield base printed circuit mtg | 1 |
| 20 | 2950-0033 | Nut: 1/2 in. wide 3/8-32 thd | 7 |
| 21 | 2950-0001 | Nut: 1/2 in. wide 3/8-32 thd | 11 |
| 22 | 628A-65C | Board: Modulator | 1 |
| 23 | 5020-0238 | Head: Coupler 3/4 in. dia | 1 |
| 24 | 3050-0080 | Washer: Bakelite 1/4 in. dia | 1 |
| 25 | 5020-0341 | Shaft: 1/4 in. ss 1-5/8 in. lg | 1 |
| 26 | 5040-0212 | Insulator: Coupler 1 in. dia | 3 |
| 27 | | See Operating and Service Manual | |
| 28 | 2550-0009 | Screw: Bind head ss 8-32 thd 1/2 in. lg | 1 |
| 29 | 0590-0035 | Nut: For locking bushing | 2 |
| 30 | 0590-0036 | Bushing: Locking | 1 |
| 31 | 1210-0006 | Bracket: Capacitor mtg | 2 |
| 32 | 628A-41C | Board: Pot mtg | 1 |
| 33 | 2200-0005 | Screw: Round head ss 4-40 thd 5/16 in. lg | 4 |
| 34 | 2190-0004 | Washer: Int lock for #4 screw | 4 |
| 35 | 2390-0009 | Screw: Bind head ss 6-32 thd 3/8 in. lg | 2 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 36 | 628A-12C | Bracket: Right | 1 |
| 37 | 2190-0005 | Washer: Ext lock for #4 screw | 8 |
| 38 | 2260-0001 | Nut: 1/4 in. wide 4-40 thd ss | 8 |
| 39 | 2420-0003 | Nut: 1/4 in. wide 6-32 thd ss | 4 |
| 40 | 2190-0008 | Washer: Ext lock for #6 screw | 2 |
| 41 | 0360-0016 | Lug: Terminal 3/4 in. lg | 1 |
| 42 | 2550-0007 | Screw: Bind head ss 8-32 thd 3/8 in. lg | 3 |
| 43 | | See Operating and Service Manual | |
| 44 | 628A-12D | Bracket: Right | 1 |
| 45 | 2190-0009 | Washer: Int. lock for #8 screw | 2 |
| 46 | 0360-0005 | Lug: Terminal 11/16 in. lg | 1 |
| 47 | 628A-41D | Insulator: Capacitor | 1 |
| 48 | | See Operating and Service Manual | |
| 49 | | See Operating and Service Manual | |
| 50 | | See Operating and Service Manual | |
| 51 | 1210-0003 | Bracket: Capacitor mtg | 1 |
| 52 | 2200-0008 | Screw: Round head ss 4-40 thd 7/16 in. lg | 4 |
| 53 | 628A-65C-2 | Board: Thermistor | 1 |

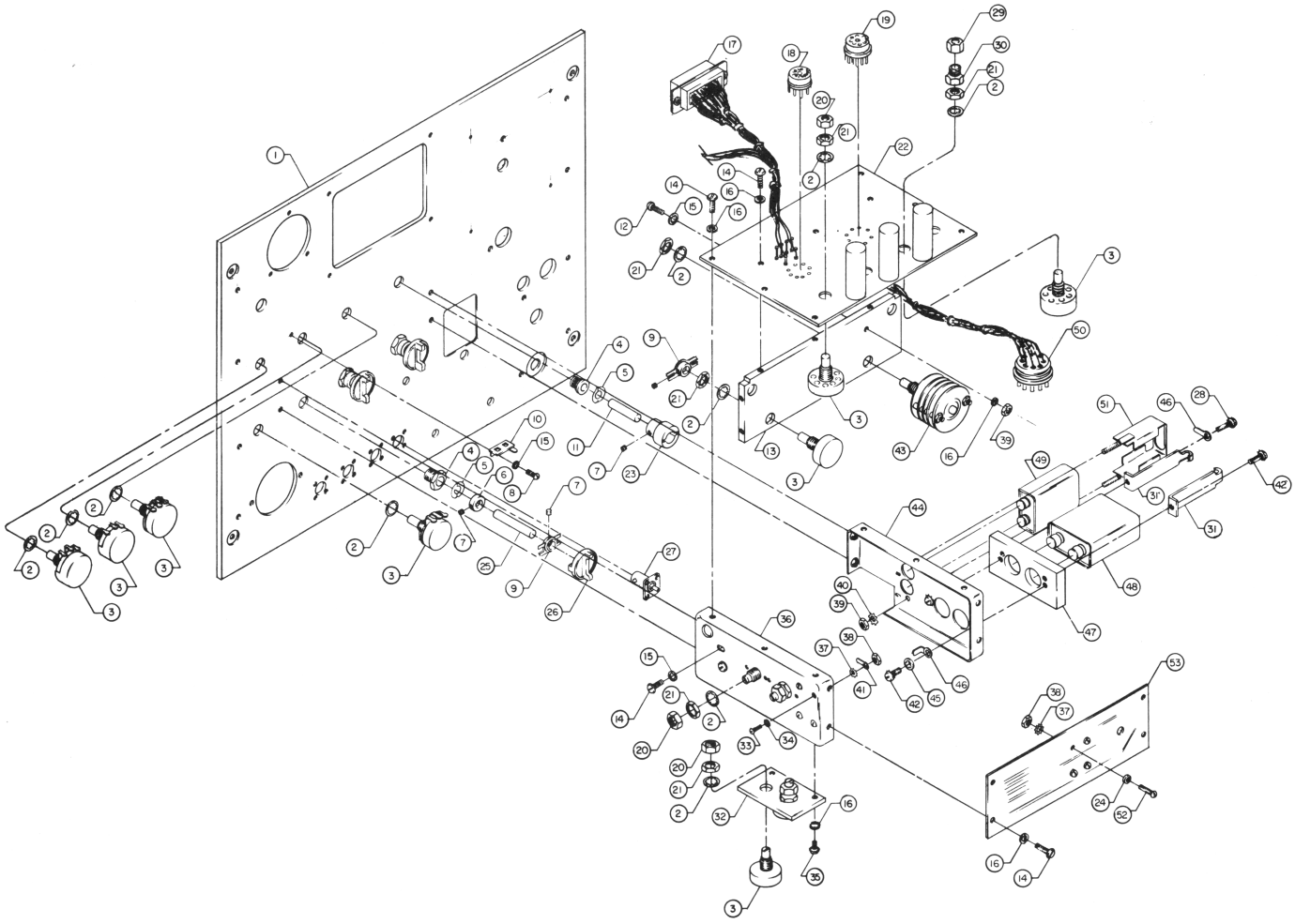

Figure 3. -hp- Model 626A, S.H.F. Signal Generator, Control Panel, Rear View

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 2360-0018 | Screw: Round head ss 6-32 thd 1-3/8 in. lg | 1 |
| 2 | | See Operating and Service Manual | |
| 3 | 3030-0005 | Screw: Allen dr set 8-32 thd 1/8 in. lg | 5 |
| 4 | 2190-0007 | Washer: Int lock for #6 screw | 3 |
| 5 | 0380-0014 | Spacer: 1-3/16 in. lg 1/4 in. o.d. | 1 |
| 6 | 3030-0001 | Screw: Allen dr set 8-32 thd 3/16 in. lg | 7 |
| 7 | 628A-36A-22 | Drive: Coupling | 1 |
| 8 | 628A-36A-5 | Cam: Microswitch | 1 |
| 9 | 5020-0389 | Washer: Spring | 3 |
| 10 | 628A-36A-13 | Hub: Cam | 1 |
| 11 | 2360-0016 | Screw: Round head ss 6-32 thd 1-1/4 in. lg | 2 |
| 12 | 628A-36A-21 | Washer | 1 |
| 13 | 2420-0001 | Nut: 5/16 in. wide ss 6-32 thd 1/2 in. lg | 1 |
| 14 | 2990-0002 | Screw: Truss head ss 10-24 thd 1/2 in. lg | 1 |
| 15 | 2190-0011 | Washer: Int lock for #10 screw | 1 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 16 | 1410-0017 | Bearing: Ball | 2 |
| 17 | 3050-0019 | Washer: 1/2 in. o.d. | 1 |
| 18 | 5020-0248 | Gear: Offset tooth | 1 |
| 19 | 3102-0002 | Lever: Switch actuator | 1 |
| 20 | 628A-36A-30 | Shaft | 1 |
| 21 | 628A-36A-23 | Cam: Drive | 1 |
| 22 | J382A-17 | Mount: Gear | 1 |
| 23 | 3050-0032 | Washer: 5/16 in. o.d. 0.190 in. i.d. brass | 11 |
| 24 | 1410-0007 | Bearing: Ball 1/2 in. o.d. 3/16 in. i.d. | 2 |
| 25 | 0570-0022 | Screw: 3/8 in. lg | 1 |
| 26 | 3030-0033 | Screw: Allen dr set 6-32 thd 3/16 in. lg | 2 |
| 27 | 628A-36A-6 | Gear: Stop | 1 |
| 28 | 628A-36A-28 | Sleeve | 1 |
| 29 | 0380-0018 | Spacer: 1/4 in. lg 1/4 in. o.d. | 2 |
| 30 | 628A-36A-27 | Eccentric | 1 |
| 31 | 628A-36A-1 | Chassis | 1 |
| 32 | 628A-36A-29 | Clamp | 1 |
| 33 | 628A-36A-13 | Hub: Cam | 1 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 34 | 3050-0014 | Washer: 3/8 in. o.d. 0.26 in. i.d. bronze | 1 |
| 35 | 626A-77A-2 | Follower: Cam | 1 |
| 36 | 1460-0022 | Spring: Tension 1/8 o.d. 1-1/2 in. lg | 2 |
| 37 | 0360-0036 | Lug: Terminal | 2 |
| 38 | 1410-0004 | Bearing: Ball 5/8 in. o.d. 1/4 in. i.d. | 3 |
| 39 | 3050-0017 | Washer: 3/8 in. o.d. 0.26 in. i.d. bronze | 3 |
| 40 | 0510-0052 | Ring: Grip for 1/8 in. shaft | 1 |
| 41 | 2470-0001 | Screw: Bind head br 6-32 thd 1/4 in. lg | 2 |
| 42 | 1410-0015 | Bearing: Ball 5/8 in. o.d. 1/4 in. i.d. | 2 |
| 43 | 1480-0001 | Pin: Cotter 1/2 in. lg | 1 |
| 44 | 628A-36A-14 | Bushing: Eccentric | 1 |
| 45 | 628A-36A-24 | Bracket: Cam follower | 1 |
| 46 | 628A-36A-2 | Shaft: Cam | 1 |
| 47 | 628A-36A-16 | Shaft: Cam roller | 1 |
| 48 | 0510-0040 | Ring: Retaining for 5/16 in. shaft | 1 |
| 49 | 628A-36A-10 | Shaft: Dial | 1 |
| 50 | 0510-0005 | Ring: Retaining for 1/4 in. shaft | 1 |

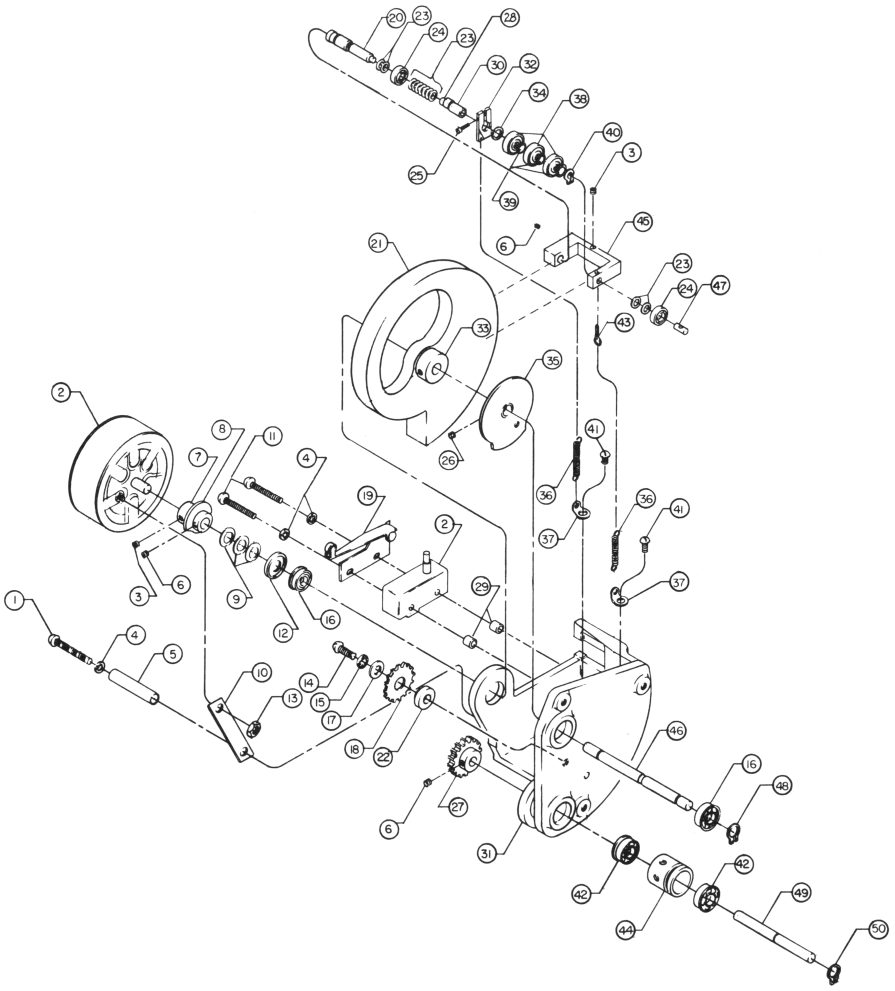



Figure 4. -hp- Model 626A, S.H.F. Signal Generator, Frequency Drive Assembly

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 2200-0010 | Screw: Round head ss 4-40 thd 3/4 in. lg | 1 |
| 2 | 626A-77A-2 | Follower: Cam | 1 |
| 3 | 626A-77A-4 | Arm: Lever | 1 |
| 4 | 0510-0005 | Ring: Retaining for 1/4 in. shaft | 1 |
| 5 | 3050-0017 | Washer: 3/8 in. o.d. 0.26 in. i.d. bronze | 3 |
| 6 | 2260-0001 | Nut: 1/4 in. wide 4-40 thd ss | 2 |
| 7 | 2190-0004 | Washer: Int lock for #4 screw | 2 |
| 8 | 626A-77A-3 | Nut: Elastic | 1 |
| 9 | 2200-0004 | Screw: 4-40 thd | 2 |
| 10 | 0520-0001 | Screw: 2-56 thd | 4 |
| 11 | 0510-0011 | Ring: Retaining | 1 |
| 12 | 2210-0004 | Screw: Flat head ss 4-40 thd 1/2 in. lg | 1 |
| 13 | 626A-77A-5 | Hub: Lever arm | 1 |
| 14 | 3030-0026 | Screw: Cap | 1 |
| 15 | 26A-77C-1 | Holder: #2 | 1 |
| 16 | 628A-32A-3 | Load: Coupler | 2 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 17 | 626A-37A | Shaft: Lever arm | 1 |
| 18 | 626A-59A-10 | Plate: Bearing | 1 |
| 19 | 3050-0014 | Washer: 3/8 in. o.d. 0.26 in. i.d. bronze | 2 |
| 20 | 3030-0001 | Screw: Allen dr. set 8-32 thd 3/16 in. lg | 1 |
| 21 | 0570-0022 | Screw: 1-72 thd | 2 |
| 22 | 3050-0010 | Washer: 5/16 in. o.d. | 4 |
| 23 | 626A-77E-2 | Holder: Load | 1 |
| 24 | 2200-0009 | Screw: Round head ss 4-40 thd 1/2 in. lg | 1 |
| 25 | 0510-0039 | Ring: Retaining for 1/2 in. hsg | 1 |
| 26 | 3030-0033 | Screw: Allen dr set 6-32 thd 3/16 in. lg | 2 |
| 27 | 1460-0036 | Spring: Compression 6 turns x 9/32 in. lg | 1 |
| 28 | 626A-77A-8 | Spring: End plate | 1 |
| 29 | 626A-59A-9 | Load: Plunger | 1 |
| 30 | 626A-59A-3 | Plunger Assy | 1 |
| 31 | 3030-0016 | Screw: Allen dr cap 6-32 thd 1/2 in. lg | 8 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 32 | 0570-0023 | Screw: 0-80 thd | 2 |
| 33 | 0590-0026 | Nut: 3/32 in. wide 0-80 thd br | 2 |
| 34 | 626A-77A-7 | Pin: Suppressor | 1 |
| 35 | 626A-77A-6 | Pin: Guide | 1 |
| 36 | 0570-0007 | Screw: Fil head br 0-80 thd 3/16 in. lg | 1 |
| 37 | 626A-77E-1 | Load: 1/4 wave | 1 |
| 38 | 626A-59A-1 | Casting | 1 |
| 39 | 626A-59A-2 | Cap: Tube | 1 |
| 40 | 3030-0003 | Screw: Allen dr set cap 6-32 thd 3/8 in. lg | 12 |
| 41 | 626A-77B-2 | Load: 3/4 wave | 1 |
| 42 | 626A-77B-3 | Holder: #1 | 1 |
| 43 | 3030-0028 | Screw: Allen dr set cap 6-32 thd 1/4 in. lg | 1 |
| 44 | 3030-0030 | Screw: Allen dr set cap 6-32 thd 1 in. lg | 2 |
| 45 | 626A-77B-1 | Screw: Lock | 1 |
| 46 | | See Operating and Service Manual | |

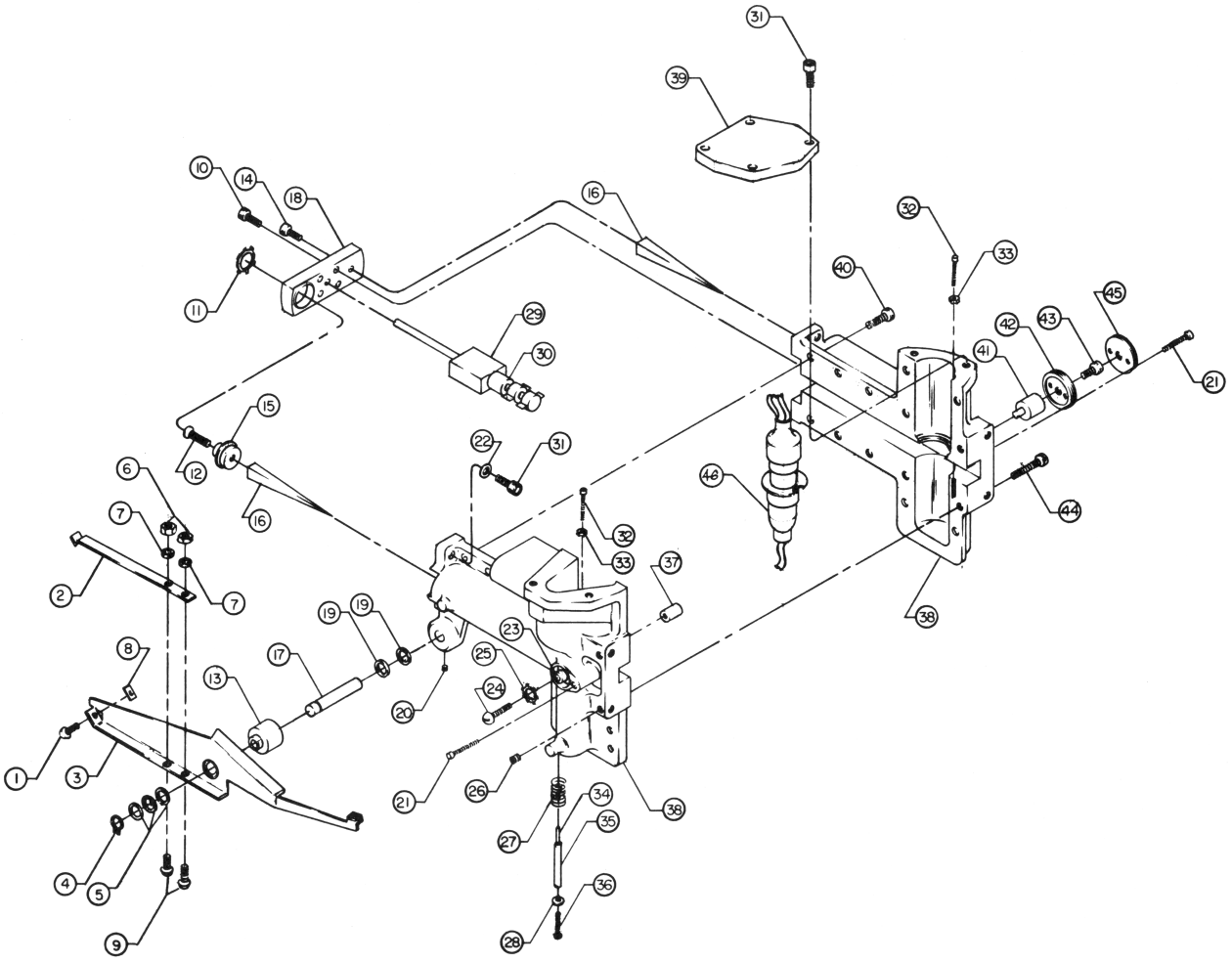




Figure 5. -hp- Model 626A, S.H.F. Signal Generator, Cavity Assembly

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 3050-0103 | Washer: 9/16 in. o.d. 1/4 in. i.d. ss | 1 |
| 2 | 628A-32A-4 | Shaft: Pinion | 1 |
| 3 | 5000-0206 | Washer: Spring 9/16 in. lg | 1 |
| 4 | 626A-34B-1 | Tube: Screwdriver | 1 |
| 5 | 5020-0233 | Collar: 1/4 in. shaft 1/2 in. dia | 1 |
| 6 | 3050-0032 | Washer: 5/16 in. o.d. 0.190 in. i.d. brass | 4 |
| 7 | 61B-27 | Filter Assembly | 1 |
| 8 | 3030-0001 | Screw: Allen dr set 8-32 thd 3/16 in. lg | 2 |
| 9 | 626A-32A-1 | Coupler | 1 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 10 | 2200-0003 | Screw: Round head ss 4-40 thd 1/4 in. lg | 1 |
| 11 | 3030-0016 | Screw: Allen head ss 4-40 thd 1/2 in. lg | 8 |
| 12 | 2950-0001 | Nut: 1/2 in. wide 3/8-32 thd br | 1 |
| 13 | 2190-0016 | Washer: Int lock 1/2 in. o.d. | 1 |
| 14 | 2210-0004 | Screw: Flat head ss 4-40 thd 1/2 in. lg | 1 |
| 15 | 626A-32A-2 | Block: End | 1 |
| 16 | 628A-32A-3 | Load: Coupler | 1 |
| 17 | 0510-0053 | Ring: Grip for 3/16 in. shaft | 1 |
| 18 | 2420-0001 | Nut: 5/16 in. wide ss 6-32 thd w/lock | 4 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 19 | 626A-27A | Filter | 1 |
| 20 | 626A-28 | Mount: Thermistor | 1 |
| 21 | 3030-0013 | Screw: Allen dr cap 6-32 thd 3/4 in. lg | 4 |
| 22 | 628A-24C | Pinion: Power set | 1 |
| 23 | 1480-0008 | Pin: 1/16 in. dia 1/2 in. lg | 2 |
| 24 | 628A-32A-6 | Shaft: Bevel gear | 1 |
| 25 | 626A-37B | Shaft | 1 |
| 26 | 3030-0060 | Screw: Allen head set 2-56 thd | 2 |
| 27 | 3030-0007 | Screw: Allen dr set 4-40 thd 1/8 in. lg | 2 |
| 28 | 626A-71A | Coupler: Power set | 1 |
| 29 | 628A-24D | Gear: Bevel | 1 |

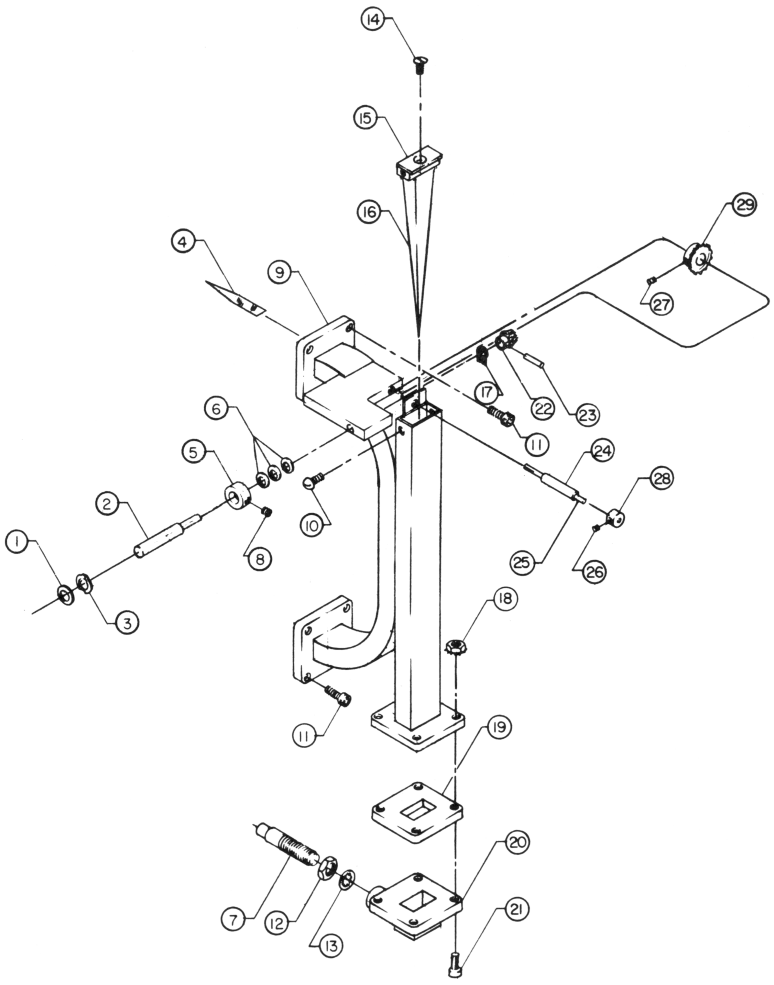




Figure 6. -hp- Model 626A, S.H.F. Signal Generator, Directional Coupler Assembly

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 2360-0012 | Screw: Round head ss 6-32 thd 7/8 in. lg | 4 |
| 2 | 2390-0001 | Screw: Bind head ss 6-32 thd 1/2 in. lg | 27 |
| 3 | 2360-0008 | Screw: Round head ss 6-32 thd 1/2 in. lg | 12 |
| 4 | 1480-0063 | Pin: Dowel 1/4 in. lg | 2 |
| 5 | 626A-34A-2 | Connector 180° | 1 |
| 6 | 626A-34A-14 | Card: Bent | 2 |
| 7 | 2360-0008 | Screw: Round head ss 6-32 thd 7/8 in. lg | 8 |
| 8 | 2190-0007 | Washer: Int lock for #6 screw | 8 |
| 9 | 1480-0015 | Pin: Dowel 1/4 in. dia 3/8 in. lg | 4 |
| 10 | 626A-34A-16 | Adapter | 2 |
| 11 | 626A-34A-21 | Insert: Attenuator | 2 |
| 12 | 1410-0021 | Bearing: Ball 2-1/4 in. o.d. 1.813 i.d. | 4 |
| 13 | 626A-34A-3 | Center: Section | 2 |
| 14 | 0360-0005 | Lug: Terminal 11/16 in. lg | 4 |
| 15 | 626A-34A-5 | Cover: Attenuator | 1 |
| 16 | 8160-0009 | Braid: R.F. 1/4 in. dia alum | A/R |
| 17 | 1460-0022 | Spring: Tension 1/8 in. o.d. 1-1/2 in. lg | 2 |
| 18 | 626A-34A-12 | Card: Center | 2 |
| 19 | 2460-0001 | Screw: Phillips br 6-32 thd 1/4 in. lg | 2 |
| 20 | 3030-0022 | Screw: Allen dr set 6-32 thd 1"8 in. lg | 1 |
| 21 | 628A-34A-19 | Bracket: Flag mounting | 1 |
| 22 | 3050-0017 | Washer: 3/8 in. o.d. 0.26 i.d. bronze | 1 |
| 23 | 626A-34A-28 | Ring: Retaining | 4 |
| 24 | 628A-34A-6 | Flag: Assembly | 1 |
| 25 | X382A-5 | Shaft: Flag | 1 |
| 26 | X382A-4 | Spring: Flag | 1 |
| 27 | 2370-0007 | Screw: Flat head ss 6-32 thd 1 in. lg | 2 |
| 28 | 0361-0032 | Eyelet: Flat fl type .084 o.d. | 2 |
| 29 | 9300-0015 | Spring: Braided nylon 45 lb test | A/R |
| 30 | X885-29 | Window | 1 |
| 31 | 2390-0007 | Screw: Bind head ss 6-32 thd 5/16 in. lg | 2 |
| 32 | 626A-34A-16 | Adapter | 2 |
| 33 | 0900-0008 | O-Ring: 1.188 i.d. 1.438 o.d. | 2 |
| 34 | 3050-0015 | Washer: 5/8 in. o.d. | 4 |
| 35 | 8160-0008 | Braid: R.F. 1/4 in. dia alum | A/R |
| 36 | 3030-0003 | Screw: Allen dr cap 6-32 thd 3/8 in. lg | 2 |
| 37 | 628A-34A-7 | Shaft: Lock | 1 |
| 38 | 5020-0233 | Collar: 1/4 in. shaft 1/2 in. dia | 2 |
| 39 | 5000-0206 | Washer: Spring 9/16 in. dia | 2 |
| 40 | 628A-34A-11 | Dial: Attenuator | 1 |
| 41 | 0520-0009 | Screw: Flat head ss 2-56 thd 1/4 in. lg | 2 |
| 42 | X382A-18 | Hub: Dial | 1 |
| 43 | 3030-0021 | Screw: Allen dr set 8-32 thd 3/16 in. lg | 2 |
| 44 | 2460-0003 | Screw: Phillips br 6-32 thd 5/16 in. lg | 2 |
| 45 | 0380-0011 | Spacer: 3/4 in. lg 1/4 in. o.d. | 2 |
| 46 | 628A-34A-29 | Shield | 1 |
| 47 | 2420-0003 | Nut: 1/4 in. wide 6-32 thd | 2 |
| 48 | 2390-0009 | Screw: Bind head ss 6-32 thd 3/8 in. lg | 2 |
| 49 | 0380-0003 | Spacer 1/8 in. lg 1/4 in. o.d. | 2 |
| 50 | 628A-34A-31 | Pulley Assembly | 1 |
| 51 | 626A-34A-4 | Housing: Attenuator | 1 |
| 52 | 1410-0015 | Bearing: Ball 5/8 in. o.d. 1/4 in. i.d. | 2 |
| 53 | 0510-0065 | Ring: Retaining for 1/4 in. shaft | 2 |
| 54 | X382A-36 | Gear: Stop | 1 |
| 55 | 3050-0019 | Washer: Brass 1/2 in. o.d. 2 in. i.d. | 4 |
| 56 | J382A-4 | End: Section | 1 |
| 57 | 5020-0248 | Gear: Offset tooth 1.218 in. dia | 1 |
| 58 | 2190-0011 | Washer: Int lock for #10 screw | 1 |
| 59 | 2920-0003 | Screw: Round head ss-10-24 thd 5/8 in. lg | 1 |
| 60 | 628A-34A-1 | Shaft: Worm | 1 |
| 61 | 626A-34A-17 | Mount: Bearing | 2 |
| 62 | 626A-34A-22 | Choke: End section | 1 |
| 63 | 626A-34A 13 | Card: End | 2 |
| 64 | 626A-34A-23 | End: Section | 2 |

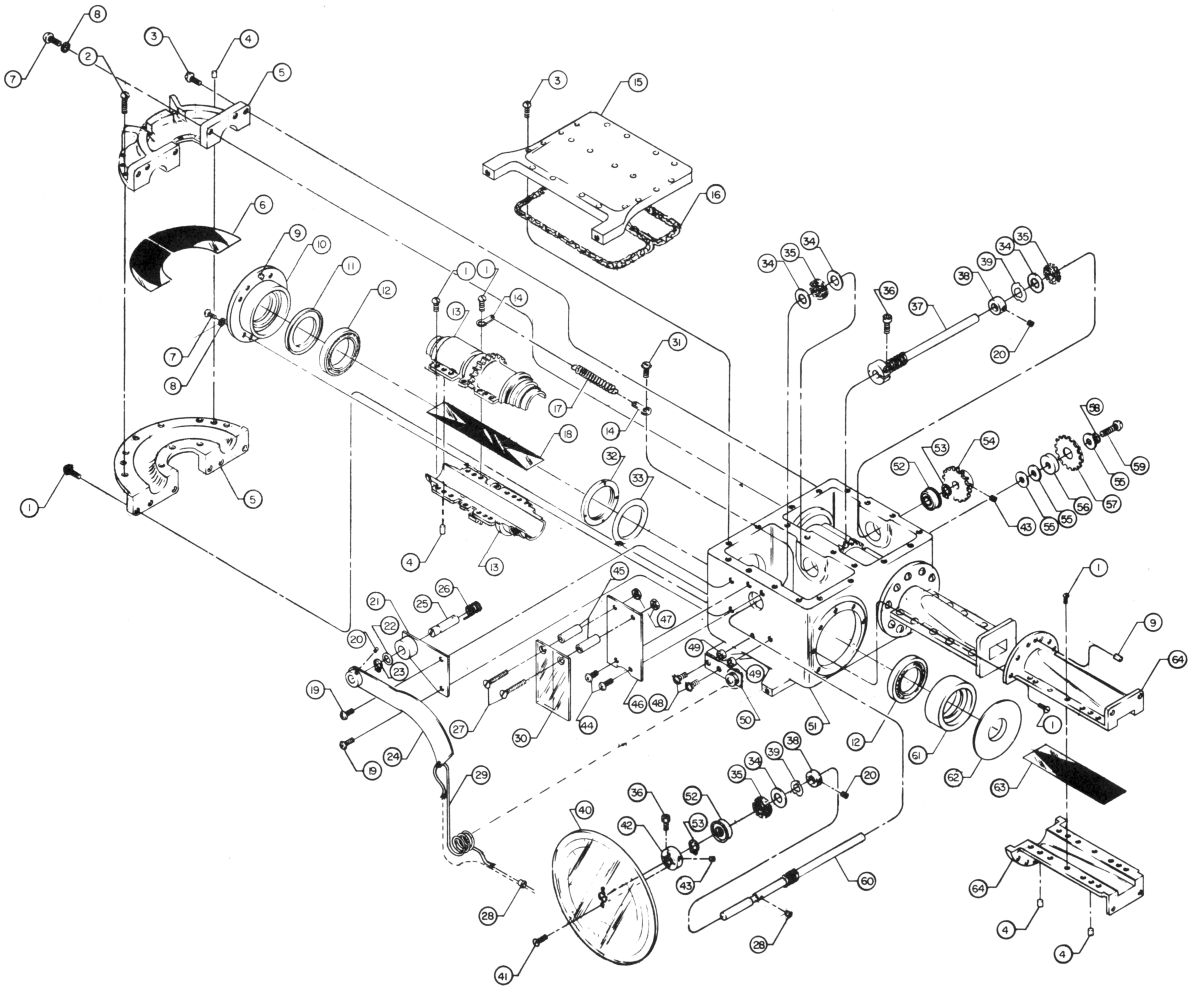



Figure 7. -hp- Model 626A, S.H.F. Signal Generator, Attenuator Assembly

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 2990-0001 | Screw: Truss head ss 10-24 thd 3/8 in. lg | 11 |
| 2 | 2930-0004 | Screw: Flat head ss 10-24 thd 1/2 in. lg | 3 |
| 3 | 2370-0002 | Screw: Flat head ss 6-32 thd 3/8 in. lg | 4 |
| 4 | 628A-1AL | Gusset: Left | 1 |
| 5 | 2900-0002 | Screw: Truss head 10-24 thd 1/2 in. lg | 1 |
| 6 | 2550-0007 | Screw: Bind head ss 8-32 thd 3/8 in. lg | 5 |
| 7 | 1251-0026 | Connector: Male 8 pin | 4 |
| 8 | 2980-0002 | Nut: 3/8 in. wide 10-24 thd w/lock | 1 |
| 9 | 628A-12N | Bracket | 1 |
| 10 | 628A-12G | Bracket | 1 |
| 11 | 1200-0005 | Socket: Octal tube | 4 |
| 12 | 1400-0033 | Clamp: Tube 1-1/4 in. dia | 1 |
| 13 | 626A-65E | Board Assy: Voltage regulator | 1 |
| 14 | 1400-0032 | Clamp: Tube 1-5/8 in. dia | 1 |
| 15 | 2420-0001 | Nut: 5/16 in. wide ss 6-32 thd w/lock | 7 |
| 16 | 1250-0075 | Connector: BNC | 3 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 17 | 626A-65D | Attenuator Assy: Power set | 1 |
| 18 | 1200-0053 | Socket: 7 pin tube printed circuit mtg | 11 |
| 19 | 628A-12F | Bracket | 1 |
| 20 | 1200-0035 | Socket: 11 pin tube | 1 |
| 21 | 1200-0008 | Socket: 9 pin tube | 1 |
| 22 | 3050-0100 | Washer: 7/16 in. o.d. 0.147 i.d. brass | 2 |
| 23 | 0380-0008 | Spacer: 1/2 in. lg 1/4 in. o.d. | 2 |
| 24 | 2360-0005 | Screw: Round head ss 6-32 thd 3/8 in. lg | 2 |
| 25 | 628A-12P | Bracket | 1 |
| 26 | 2360-0018 | Screw: Round head ss 6-32 thd 1-1/2 in. lg | 2 |
| 27 | 628A-1 | Chassis | 1 |
| 28 | 628A-65D | Board Assy: Circuit | 1 |
| 29 | 2190-0005 | Washer: Ext lock for #4 screw | 2 |
| 30 | 1200-0062 | Socket: 9 pin tube mtg printed circuit | 4 |
| 31 | 2260-0001 | Nut: 1/4 in. wide 4-40 thd ss | 4 |
| 32 | 2190-0004 | Washer: Int lock for #4 screw | 2 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 33 | 0380-0014 | Spacer: 1-3/16 in. lg 1/4 in. o.d. | 1 |
| 34 | 3100-0121 | Switch: Rotary | 1 |
| 35 | 628A-12K | Bracket | 1 |
| 36 | 3030-0020 | Screw: Allen dr set 8-32 thd 3/16 in. lg | 2 |
| 37 | 628A-1AR | Gusset: Right | 1 |
| 38 | 2190-0016 | Washer: Int lock 0.185 in. o.d. | 1 |
| 39 | 2950-0001 | Nut: 1/2 in. wide 3/8-32 thd br | 1 |
| 40 | 5020-0233 | Collar | 1 |
| 41 | 626A-38A | Wrench: Spanner | 1 |
| 42 | 1400-0010 | Clip: Fuse 0.406 in. lg x .375 in. w | 2 |
| 43 | 1400-0011 | Clip: Fuse 0.438 in. lg x 0.75 in. h - | 1 |
| 44 | 1400-0044 | Clip | 1 |
| 45 | 626A-38B-1 | Screwdriver | 1 |
| 46 | 626A-38B-2 | Wrench | 1 |

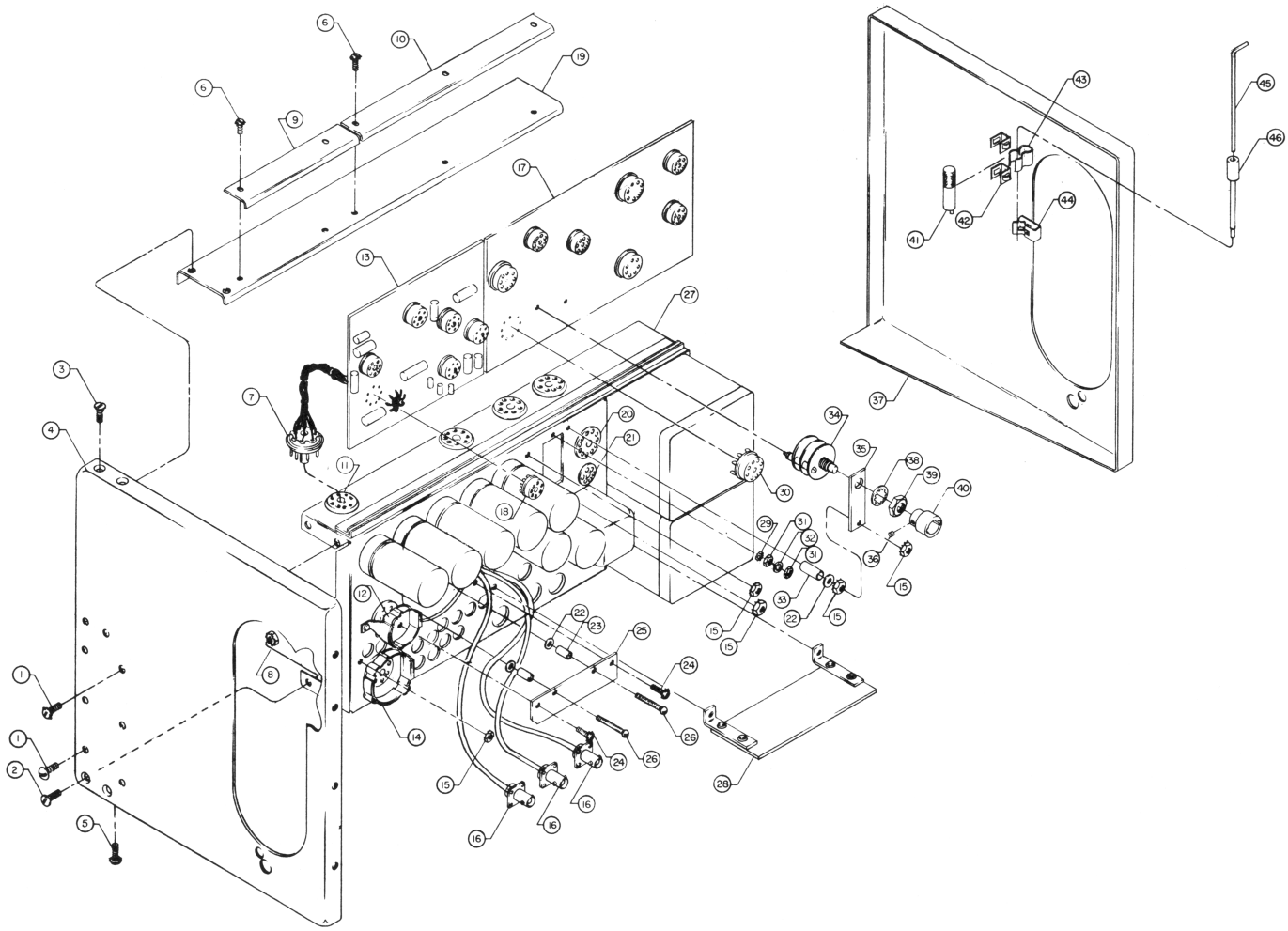

Figure 8. -hp- Model 626A, S.H.F. Signal Generator, Chassis Front View

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 628A-1 | Chassis | 1 |
| 2 | 2190-0034 | Washer: Int lock for #4 screw | 7 |
| 3 | 2740-0002 | Nut: 5/16 in. wide 10-32 thd ss | 7 |
| 4 | 1400-0031 | Clamp: Cable 3/8 in. dia nylon | 1 |
| 5 | 3050-0002 | Washer: 7/16 in. o.d. 0.203 in. i.d. steel | 1 |
| 6 | 2740-0003 | Nut: 3/8 in. wide 10-32 thd w/lock | 1 |
| 7 | 2420-0001 | Nut: 5/16 in. wide ss 6-32 thd w/lock | 4 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 8 | | See Operating and Service Manual | |
| 9 | 2360-0020 | Screw: Round head ss 6-32 thd 2 in. lg | 3 |
| 10 | 0360-0012 | Strip: 1 terminal | 1 |
| 11 | 1200-0005 | Socket: Octal tube | 6 |
| 12 | 2360-0005 | Screw: Round head ss 6-32 thd 3/8 in. lg | 2 |
| 13 | 2440-0007 | Screw: Round head br 6-32 thd 2-1/2 in. lg | 2 |
| 14 | 3030-0001 | Screw: Allen dr set 8-32 thd 3/16 in. lg | 2 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 15 | 2360-0013 | Screw: Round head ss 6-32 thd 1 in. lg | 2 |
| 16 | 3160-0012 | Fan Blade: 4 blades 4.5 in. dia | 1 |
| 17 | 0360-0015 | Strip: 3 terminal 2 in. 1 gnd | 1 |
| 18 | 1520-0001 | Plate: Capacitor mtg 1-17/32 x 2-3/16 in. | 2 |
| 19 | 2190-0021 | Washer: Int lock for #4 screw | 5 |
| 20 | 2950-0042 | Nut: 1 in. wide 3/4-20 thd br | 5 |

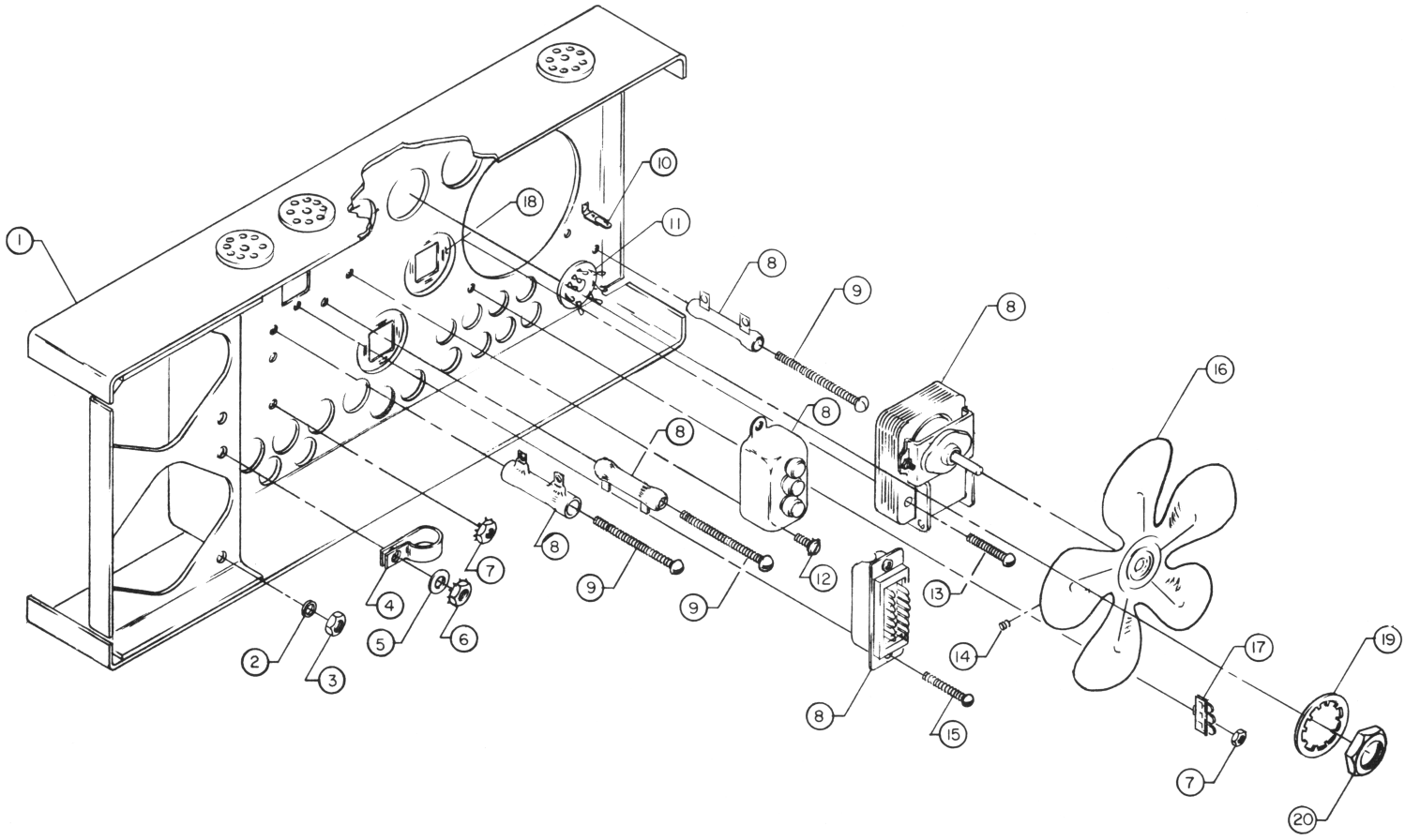




Figure 9. -hp- Model 626A, S.H.F. Signal Generator, Chassis, Rear View

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 628A-44A | Dust: Cover | 1 |

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|

| REF. | STOCK NO. | DESCRIPTION | QTY. |
|---|---|---|---|

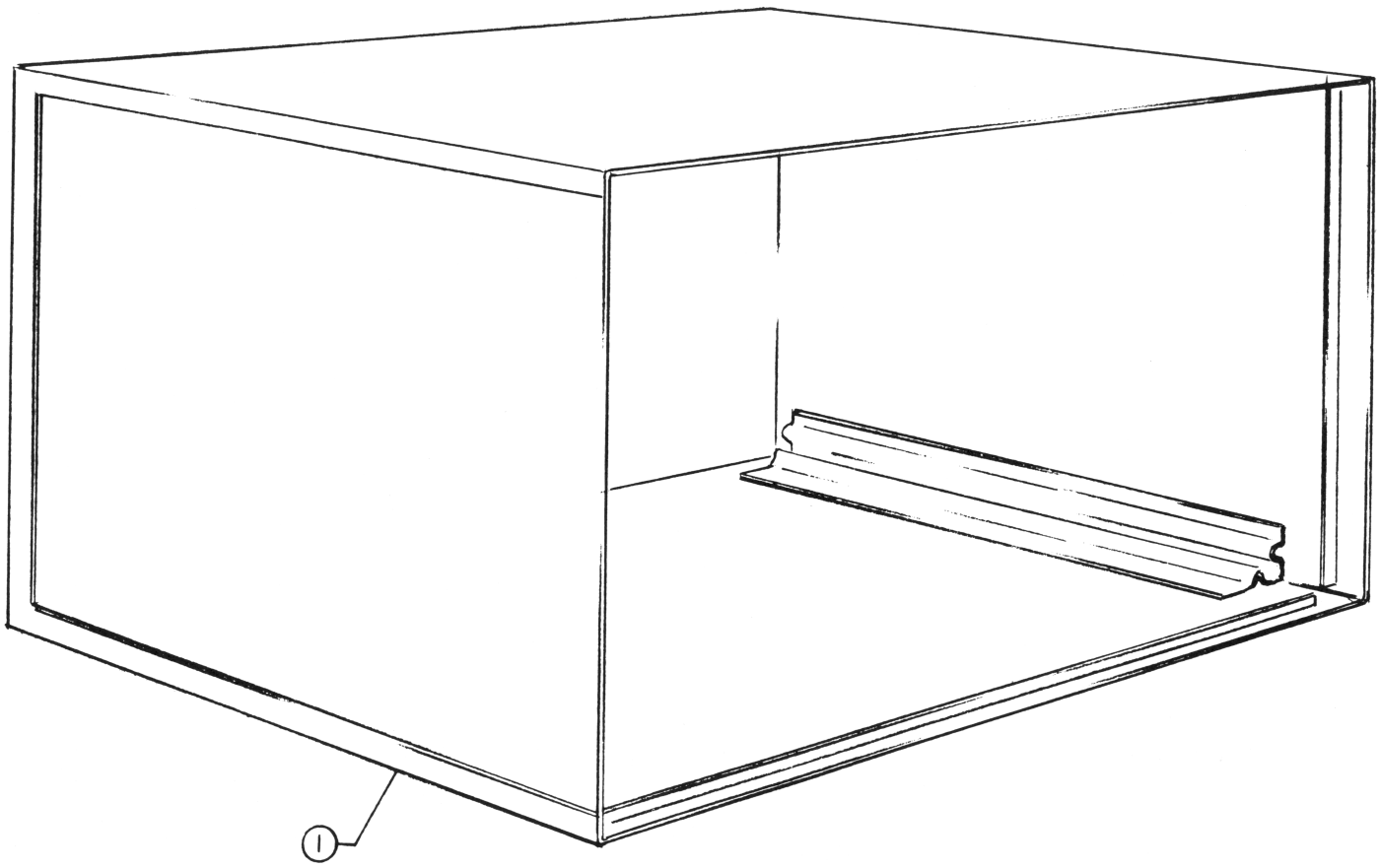




Figure 10. -hp- Model 626A, S. H. F. Signal Generator, Cabinet

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